PB-230 065

PUBLIC HEARINGS ON NOISE ABATEMENT AND CONTROL. VOLUME III. URBAN PLANNING, ARCHITECTURAL DESIGN; AND NOISE IN THE HOME, MEETING HELD IN TEXAS ON AUGUST 18-19, 1971

Environmental Protection Agency
Washington, D. C.

August 1971

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 230 065

PUBLIC HEARINGS ON NOISE ABATEMENT AND CONTROL

Vol. III—Urban Planning, Architectural Design; and Noise in the Home

Dallas, Texas
August 18-19, 1971

Conducted by
the
Office of Noise Abatement and Control

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

U. S. Environmental Protection Agency
Washington, D.C. 20460

[redacted]

INDEX OF WITNESSES

	Page
Mr. Wes Wise	1
Mr. Edward C. Fritz	5
Dr. Hal Watson, Jr.	14
Mrs. Roger C. Fletcher	19
Mrs. Franklyn Wright	24
Mrs. Robert Sapp	28
Mrs. Charles M. Thompson	31
Mrs. Henry Richardson	33
Dr. Robert Finch	38
Mr. J. W. Joiner	45
Mr. Rod Rylander	51
Mrs. Sharon Stewart	52
Mr. Tom Maddox	60
Mr. Dan DeGrassi	64
Miss Mary Anne Mayer	66
Hon. Joseph Allen	68
Mr. Bob Johnson	72
Mr. Robert H. Pish	75
Mr. John Burdis	87
Mr. Bart Spano	91
Mr. Charles D. Parrott	103
Mr. Bailus Walker, Jr.	109
Mr. Robert L. Wegner, Sr.	115
Mr. Gene Schrickel	124
Mr. David McCandless, Jr.	129
Dr. Elmer Hixson	136
Mr. Herbert Phillips	141
Mr. John E. Dorn	146
Mr. J. E. Duff	155
Mr. E. B. Thompson and Mr. W. G. Martin	157
Mr. Arthur E. Meling and Mr. W. Scott Bayless	164

Preceding page blank

PREFACE

Under the Noise Pollution and Abatement Act of 1970 (Title IV to the Clean Air Amendment of 1970 (PL 91-604)), the Environmental Protection Agency, through the Office of Noise Abatement and Control, is required to hold public hearings.

A series of eight hearings are being conducted in selected cities to aid the Office of Noise Abatement and Control in compiling information relevant to its investigation of the Problem of Noise Pollution. Further, these hearings present an opportunity for the public and industry to express their viewpoints on the general subject of noise control. The volumes in the complete series will be:

Vol. I —Noise in Construction

Vol. II —Manufacturing and Transportation Noise (Highway and Air)

Vol. III —Urban Planning, Architectural Design; and Noise in the Home

Vol. IV —Standards and Measurement Methods, Legislation and Enforcement Problems

Vol. V —Agriculture and Recreational use Noise

Vol. VI —Transportation (Rail and Other), Urban Noise Problems and Social Behavior

Vol. VII —Physiological and Psychological Effects

Vol. VIII—Technology and Economics of Noise Control; National Programs and their Relations with State and Local

ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON URBAN PLANNING, ARCHITECTURAL DESIGN AND NOISE IN THE HOME

WEDNESDAY, AUGUST 18, 1971

The hearing was convened at 9 a.m., Dr. Alvin F. Meyer, Jr. Director, Office of Noise Abatement and Control, Environmenta Protection Agency, presiding as Chairman.

Panel: Theodore Berland, Citizens Against Noise; Prof. Leo Cole, University of Texas; Dr. Aram Glorig, Callier Hearin and Speech Institute; Prof. Robert Newman, Massachusetts Institute of Technology, Bolt, Beranek and Newman; Prof. W. Dixo Ward, University of Minnesota; Prof. Jack Westman, Universit of Wisconsin.

PROCEEDINGS

Dr. **MEYER**. I hereby call to order the first session of the Environmental Protection Agency hearings on noise, held under a mandate from the Congress in title IV of Public Law 91-604. I'm Dr. Alvin F. Meyer, Jr., Director of the Office of Noise Abatement and Control of the U.S. Environmental Protection Agency.

Before starting this session, I'm most pleased and honored to be in the presence of Mr. Wes Wise, his excellency, the mayor of the city of Dallas. In communications with our Agency he has indicated his interest in environmental matters and his understanding of the matters which we are experiencing. He is outstanding as a public official and leader of one of the Nation's largest cities. Mayor Wise, I'm pleased to have you here, sir.

STATEMENT OF MAYOR WES WISE, CITY OF DALLAS

Mr. **WISE**. Thank you, Dr. Meyer. Thank you very much.

Dr. Meyer, distinguished panelists, ladies and gentlemen, the very fact, Dr. Meyer, that you are here and I am here and they are there is encouragement, I think, that our Nation and our municipalities have individually and collectively recognized still another very delicate and important ecological imbalance, and I hope that in the next few days and hours we will work together to find an ultimate solution, which is the spirit of this meeting.

I returned to the place of my birth about 25 years ago and looked upon what was once lovely pine tree fields of northwest Louisiana where I used to run. The cool shade that covered me before the days of air conditioning had been displaced by a harsh summer sun and I was personally offended. I returned to the place of my birth last month, and once again the barren fields were covered with deep, green, tall, stately pines. The landscape was even lovelier than it had been 25 years before during my childhood. As a result of the technology of reforesting, the ecological balance, which is still a mystery to many of us, has been returned in my home town of Shreveport in this particular place, and that is good. But what of the interim period, and what happens now? Furthermore, how many jobs were produced in that 25 years in cutting the timber and trucking it and replanting it? How many little mouths were fed in its eventual use in construction? How many members of our minorities were helped out of poverty, taken off the welfare rolls, placed on the payrolls and the tax rolls? Now that that forest is ripe once again, what are the rights of the owner of the property on which it now thrives? He has paid his taxes on the property that he owns. He has paid Federal taxes, he's paid State taxes, and he's paid local taxes faithfully, well and on time. What responsibility does he now owe the general community over and above making it possible for people to have jobs and contribute to happy lives? Does he owe anything at all to other little boys who would like to have peaceful, tall pine forests in which to run?

Let's take another true incident closer to home and closer to the subject perhaps of this meeting. During the recent mayorial campaign I promised to fight for a reduction in crime. Undoubtedly this was the priority item in a list of four problems, which also included, however, a fight for environmental quality in the city of Dallas. Dallas experienced a dramatic percentage decrease in crime in my first 3 months in office, for which this city received a national recognition, and more important, local recognition from our citizens. There is little doubt that our helicopter units have been instrumental in prevention techniques in crime. But in the early days of their use, particularly, city hall received a rash of complaints about the noise of the whirring, rasping engines of the police helicopters. But yet a lady in a high crime incident area of south Dallas called me just the other night and said she could now sleep more soundly at night when she heard the same sound, which was to her a lovely, beautiful hum. And my teenagers continue to run outdoors to see the floodlights from this same helicopter, fascinated by the innovativeness and imagination of this crime detection technique which is proven and true.

While still another citizen will undoubtedly find that that same spotlight is an invasion of his or her property.

Just how important is noise in the overall ecological picture? Tokyo went through its worst environmental crisis last year. It was discovered that people living near congested intersections were badly affected by atmospheric lead caused by exhaust gas from automobiles. A July incident of some 40 school girls suddenly falling ill by photochemical smog on their school ground caused a national sensation and panic. In October certain fields producing rice in suburban Tokyo were found to be cadmium contaminated; air pollution, water and land pollution, all of these in Tokyo, and yet 5,496 complaints and grievances received by the city government of Tokyo in 1969, of those some 5,000—approximately 5500—57 percent concerned noise and vibration nuisances rather than the other ecological factors. This included noise from motor vehicles, factories, construction jobs and jet planes.

So the question in noise abatement, as in other environmental considerations, Dr. Meyer, in my opinion, centers on a balance which must be found between promotion of the citizens' ecological health and welfare on the one hand, and the citizens' economic health and welfare on the other hand. Those of us in positions of some authority must not judge present day considerations on what others have historically done, for a number of past occurrences would certainly be unthinkable in today's context. Certainly one may not assess the performance of local authorities of some 15 or 20 years ago on the basis of present day criteria. We in this Nation, and especially in Texas where we still have the wide-open spaces and in Dallas where preventive measures can be taken in this field, just as they were made in the field of crime as cited a moment ago, still have before us the time, the opportunity and the challenge of preserving and improving clean air, clear water, quiet homes, and streets, and thus also improving and preserving the minds and the bodies and the health of all of us of the city.

So I welcome you, Sir, and I do feel that this conference will bring out results, will bring out factors that we all need to be aware of, and as we continue to be aware of them, that we will address ourselves to them in a spirit of cooperation with the citizens.

Of course, that's the most important element. As both you and I know, you from the Federal standpoint and myself from the local standpoint, I'm sure we will accomplish this, we will find the answers.

Thank you very much.

Dr. **MEYER**. Mr. Mayor, on behalf of the Administrator of the EPA, Mr. Ruckelshaus, and myself as one of his key staff personnel, I want to thank you for putting the noise problem in perspective as you did in your very excellent dissertation and welcome you here. Thank you very much, sir. I hope you will be able to join us and watch our proceedings for a while.

At this point, then, ladies and gentlemen, I would like to introduce the panel. And then I would like to explain to you a little bit about the purpose of these hearings, how we conduct them and what happens to the information obtained in their course.

So without further ado, I will introduce the gentlemen who, as public-spirited citizens performing a public service, are serving the Federal Government on this panel.

First is Mr. Theodore Berland, who is the author of the book, "The Fight for Quiet" and president of an organization known as Citizens Against Noise, of Chicago, Ill. Mr. Berland.

Next, Prof. Leon Cole of the University of Texas, who is conducting an immense amount of work in the field of environmental activities. Mr. Cole.

And next, an eminent member of the acoustical profession and known, I presume, to many citizens of Dallas, Dr. Aram Glorig, director of the Callier Hearing and Speech Institute, and a longtime colleague.

And next, Dr. Robert Newman, professor at the Massachusetts Institute of Technology, and a member of the firm of Bolt, Beranek and Newman, an internationally known acoustical engineering and consulting firm.

Next, Dr. W. Dixon Ward of the Hearing Research Institute of the University of Minnesota. Dr. Ward is the incoming chairman of the National Research Council Committee on Hearing, Bioacoustics and Biodynamics.

Tomorrow we will be joined by Dr. Jack Westman from the Department of Psychiatry of the University of Wisconsin.

Now, let me briefly explain to you what these hearings are all about. As I indicated in opening this session, Congress late last year enacted into law the Noise Pollution and Abatement Act of 1970, which is title IV of Public Law 91-604. In that law, Congress directed the Administrator of the Environmental Protection Agency to make a study on noise problems in the United States with a view to submitting recommendations to the Congress as to what programs are needed for the correction of the problems and what also might be done in relation to Federal, State and local activities. In undertaking this study, Congress also directed us to hold a series of public hearings, of which this is one. The purpose of the public hearings is to do the following things: first, find out what the public really thinks about the noise problem, and how it affects them; second, to obtain information as to what can be done about the problems, and to identify those people who are best fitted to do something about them, mainly industry, professional groups and so on. It involves obtaining information on a wide segment of problems. As an example, in Atlanta, Ga., we heard about construction problems; in Chicago, we heard about aircraft noise and highway noise and what the respective industries can do about these problems. Here we are going to talk about the problems of urban planning, and also what may be done about noise in the home. Some experts are going to talk to us about these topics tomorrow. At other hearings we are going to be dealing with the problems of enforcement, measurement, and standard setting. We will also hear a lot about the physiological and psychological effects of noise, noise as associated with agriculture and recreational use, and other aspects of noise in urban situations. And we are going to have a final hearing in Washington dealing with the entire problem of technology and economics.

Now, in holding these hearings, I am joined by a panel of experts such as we have here. You have heard these people introduced; they are all eminent individuals, and they will assist me by listening, digesting what they hear, and, if appropriate, asking questions. We have adopted the methods utilized by the House Committee on Government Operations in field investigations by the House of Representatives of the U.S. Congress. In so doing, the witness is asked to come, sit, and present his testimony. We have asked, where possible, to receive a written copy in advance. We do not—it may not sound like a very democratic process—but we do not allow questions to be directed to the witness from the floor. If any of you hear something that you feel is worthy of a question of general interest, you should write it on a piece of paper and give it to one of our staff assistants. It will be given to me, and one of the panel members will direct the question to the witness or we'll arrange for you to get the answer to your question.

And so against that background, then, without taking up more of your time, let us proceed. I would like to invite Mr. Edward C. Fritz of the Air Quality Coalition of North Texas if he would come forward, sir, and let us hear from you. Welcome, Mr. Fritz, and we look forward to hearing from you, sir.

STATEMENT OF EDWARD C. FRITZ, AIR QUALITY COALITION OF NORTH CENTRAL TEXAS

Mr. **Fritz**. Good morning, distinguished panelists, Dr. Meyer. I am president of the Air Quality Coalition of North Central Texas, and we have had a board meeting on the subject of noise at which we were pleased to have Dr. Aram Glorig of the panel present and some of the EPA staff. We have not yet formulated a policy on noise although I believe that I sensed the general attitude of the board members about their deep concern about noise. And so, what I shall say today will not yet be the official policy, if it ever is, of the Air Quality Coalition of North Central Texas.

The public of America was recently very concerned, and still is concerned about what we call the Silent Spring, because Rachel Carson came out with that. And this had to do with the death that would come to much of the life on account of pesticides. Now, the Federal Government has done a lot of talk about pesticides, and occasionally an agency will pass some kind of a proscription about pesticides and then withdraw it or not enforce it and so forth. Now, this is indeed unfortunate. We are now faced with a noisy summer, and the Federal Government, I'm happy to see, is making a lot of sound about that, and rhetoric. And I have reason to hope that more will come from this particular rhetoric than has yet come of the pesticide rhetoric, because although many pesticides have not yet been proven to have an effect upon human beings and their health so far, at least at the levels that we have yet reached, the noise has been established to have effect upon human health, physical and emotional, at certain levels. So we can hope that people will be more concerned about insisting that something be done. And second, I am impressed by the dedication of the director of the Office of Noise Abatement and Control, Dr. Meyer. So we'll look forward to actually getting some results in addition to the talk that we had to start with here.

Yes, we have come to a noisy summer, and this has been one for me. First, around in Dallas in various neighborhoods we have all kinds of racket taking place. There are power mowers, which industry and technology are efficiently building noisier and noisier and bigger and bigger. And it seems that the power mower is something that is a status symbol now, and the rate of status depends upon the amount of noise that you are able to put out.

You can impress more people up and down a further stretch of the neighborhood if you get one of the biggest and loudest machines. And also I guess that this has to do with the amount of opulence you have, because you pay in accordance with how much noise you put out, unless mufflers are ultimately required, which we hope will be the case. And then you will pay $15 extra for a muffler that will silence all the noise of as big a machine as you can get. And that amount will be reduced as mass production comes into effect for mufflers on power mowers, for example.

And then we have the minibikes in particular being noisy, and some motorcycles that the kids do the same thing with. They take off the muffler. Mufflers are now recently required by the new Dallas city ordinance, which I am glad to see, even on minibikes, motorcycles and so forth as they have been on many other motor vehicles, autos and trucks and all; but the problem of catching the kids and enforcing that is difficult. So we are going to have to go further than that before we actually do stop the minibike noise. I have not noticed any decrease in it since the new ordinance went into effect.

Then we happen to live about a mile from Love Field. And anyone who has ever been anywhere near Love Field—in fact, if you are in an office downtown, unless it's one of the most heavily walled and air conditioned and all, you'll hear the racket that comes from the airplanes there. Many of our schools hear the racket and are put out of business for a minute at a time by this noise.

So that to escape all these tremendous noises around the city, we went on a Sierra Club trip to the Guadalupe Mountains. We climbed that 2,700 feet up to the top where there is no human development whatsoever, no people reside, nothing like that. And it was just glorious. There was just the sounds of nature. And this is tremendously relaxing and relieving. And then—we started early in the morning, and after a while, well, the airplanes began to come over, and they were a little bit closer, being up there where we were at 8,200 feet, than they are on the ground, and their noise was all the more bothersome without any other noise going on. The airway, the official airway, is south of El Capitan and south of Guadalupe Peak, the highest peak in Texas. But the airplanes come right over that in great frequency, at least, right over the mountain.

So one of the things that I hope will come from your studies is enforcement of the official airways and placing them in such a way that they will not pass over the wilderness areas, the national parks and monuments, for example, and other key areas where people can go and escape from the manmade noise that we think is having a terrible impact.

So then we went to Fort Parker State Park for a conservation meeting, and unfortunately the State Parks and Wildlife Commission, in its wisdom, had just decided to put in minibike trails on an experimental basis in four of our State parks, and this was one of them. The minibikes are confined legally to the trail which is off away from the campground. They are not permitted to go into the campground. However, in a period of 1:30 p.m. to 10:30 p.m., during a meeting there, I counted 11 minibikes, loud minibikes, and motorcycles without mufflers going through the campground. And each time it would annoy everybody at the meeting because this was being held in a cabin in the campground there, an open cabin. So I talked to the park officials about it and they said, "Well, when they're there, well, these fellows will, you know pull off and be quiet." But then they can't be there all the time in the campground. They have a lot of other parts of the park to be covering and all this. And so it's virtually unenforceable. This would seem to raise the problem of whether you can have minibike trails at all in State parks without annoying everybody entirely too much and ruining the State parks for practically all purposes.

So then we went to the Big Thicket of Southeast Texas, got way out in the woods where we soon shall have a national area. And what did we hear? We heard the powersaws whanging. And that's the worst noise to me because it carries the added implication of our forests going down, as Mayor Wise so wisely commented upon earlier.

Then last week we went to High Island on the gulf coast of Texas and sat at the water's edge and heard the surf booming and roaring in and enjoyed this soothing sound of nature, which didn't bother us at all. And along the beach then comes a motorcycle with the muffler off, just roaring and making a terrible racket, and it actually did destroy the whole sound of the surf at that time. And it was followed by a succession of other motorcycles and motorbikes and even some automobiles which did not have their mufflers on and were loud, although many other automobiles had their mufflers on, and the only bother there was the disruption of any beach games or the like while everybody got aside for an automobile to come down the sand. And then along comes an airplane, and it comes right along the beach there. No control or regulation apparently is being enforced in regard to what it does. And it creates a big racket that drowns out everything for a while. A small plane, of course, can have a giant racket when it comes closer than the big planes ordinarily do. And then a helicopter comes along with its bop-bop, and whatever the soothing effect the helicopter has in the crime-ridden city, well, it doesn't have any of that out there on the beach, I'll tell you. It just ruins everything for a few minutes.

But even so, the mountains and the beach were a pleasant relief from Dallas and the noises that I started to tell about. In Dallas you have also the noises in your home about which a great deal has been written recently, in particular. The dishwasher—we want dishwashers to be controlled partly—I guess this would have to be by appeal to public response rather than by law—but partly to preserve water as well. Just use them when you have a full dishwasher, and don't feel you have to wash a few dishes every time you have some in there.

And then the clothes washers and the power mowers and the minibikes. Well, inside the house there are many other pieces of electrical equipment. So that it seems to me as if there is practically no escape from them, and it's no wonder that emotional illness is rising.

Now, urban noise has doubled since 1965, and it's expected to double again by 1984. And I am convinced that it's no coincidence that emotional illness is increasing along with urban noise. I think that there's a causal factor there. Now, one index of emotional disturbance is alienation from nature and a lot of man-made noise can very definitely alienate a person from nature. To most of us in the environmental movement, this emotional aspect of noise is more insidious than loss of hearing. Emotional illness is the cause of or aggravates or delays recovery from 90 to 100 percent of all illness. And so the effect that noise has on emotional illness is a tremendous impact upon human health.

So government regulations are going to have to include regulations of noise levels that bring about emotional response as well as merely the 90 decibel level that has been pretty widely accepted as the level that is—that is, for a certain period of time—that affects the actual hearing and other actual physical responses of the human body. Now, I think that we should regulate noises all the way down to 60 decibels, such as pneumatic drills and even freeway traffic at a 50-foot distance, and certain household appliances. What man has wrought, man can silence with mufflers. And this can be done on the manufacturing level. Shortly I'll get to which agency of government is most suited to handle each of these fields. And among the noise sources which can be technologically and socially controlled, and which should be regulated, are a vast number which were covered by L. S. Goodfriend in "Noise In the Community." And I won't read all of them. I presented that to the panel, but the headings are "Transportation Noises," "Industrial Noises," "Commercial Noises," "Community Services Noises," and "Individual Activities," which include some of these items I've mentioned around the home and also include powersaws, lathes, tool shop activities and so forth. All of these can be regulated and controlled, actually in the manufacturing process primarily, and in other ways, which our next witness, who has also been requested to speak for the Air Quality Coalition, Dr. Hal Watson, will cover from an expert viewpoint.

Now, the laws regulating noises of this nature should specify a maximum number of decibels so that manufacturers can design their equipment accordingly. Now, there is not always time though for the health officer to reach the source and set up this instrument and measure the decibels, and therefore the laws should also include alternative ground for enforcement, namely the time-honored standards of annoyance and the well established restriction of sale in case certain types of noise control equipment are not on the item, the source involved.

Every city should have a modern noise ordinance which covers all three of these factors: the decibel level, and this would include both ambient and specific, the annoyance item, and the specific equipment requirements.

Dallas happens to have what I call an archaic ordinance because it does not have the specific pressure levels, nothing in the field of decibels, and this should be included. We should pass an ordinance, and every city in this region and every city in the United States should pass an ordinance like the ones at Denver and Chicago, which have been based upon careful study, and I believe that one of the panelists had to do with the Chicago study. Now, these bring it down, for example, to 65 decibels on power lawnmowers and 55 decibels on ambient noise in residential areas.

Not all noise is in the city limits, and therefore each State should pass a statute which covers the same three areas of noise abatement.

Now, one of the problems, though, of pollution control, and this applies to air and water as well as to noise, is that there is always—for example, each locality or forum, we call this forum rivalry—there is somebody in a city, for example, a city council, in each State will be what it calls very enterprising and will want to attack industry regardless of the results. And they've figured out a way how to do this. They can go ahead and enact a strict ordinance, like a strict noise ordinance or air pollution ordinance or the like, and then satisfy all the people that they are vigorous and they are against pollution. And then, what do they do? They don't enforce it. That's satisfying all the industries that they want to attract into the cities that the industries are safe. And they set up practically a—well, such a complicated enforcement method, and such a long routine of nonenforcement in their city, such as tradition, and such an assurance that this same establishment is going to continue to run the city forever that they feel they can attract the industries and have it both ways, making the people happy thinking that they are having pollution control, and they can bring in the industry too, constantly increasing the pollution. And so what you have to have to beat this, you have to have a State level of standards and enforcement both. And the States will take over where a city fails to enact adequate ordinances or to enforce them, either way.

So then, though, we come to another problem, and that is State forum rivalry. And there will be some States where the powers will feel that they want to attract industry and that they can pull this same thing that I mentioned that the cities do. So the only way to eliminate that is to have a strong Federal standard and enforcement. In my unexpert opinion, there is no reason why we should not go right ahead with Federal standards on all these fields immediately. Certainly we are going to have to have Federal standards on the manufacture of these items that come to us because most of them are made outside of our cities. And if we get them in this mass quantity of being offered here and no alternatives, then we are going to have the noise. So we have to have good Federal standards and enforcement at the level of manufacturing, the requirement of the mufflers and other noise control devices and so forth. I think that because of forum rivalry and because of the general ineptitude of States like Texas in pollution control and cities like Dallas in pollution control and enforcement, that we are going to have to have Federal regulation of the whole noise field. And let's just start with it, and not spend all the time setting up all of these things that wasted so much of our time waiting for the States to do something about air pollution and water pollution. We have already set now Federal standards that are quick and meaningful in air pollution, the statutes are up for saying the same thing in water pollution, and let's just start with that and not wait 6 years or 8 years in the field of noise pollution.

Now, there are some Federal laws. The real solution to noise pollution is enacting and strengthening some of the acts that are now before the Congress for bringing Federal standards. And the administration has one of these acts. We do have Federal standards in occupational health and safety, the noises in that area. But for general noises, we should pass the administration's bill or strengthen it to incorporate some of the provisions that are in some of the other bills before Congress, or pass one of these other bills, particularly H.R. 6002 by Congressman Tiernan, and H.R. 6896 by Congressman Ryan. A good combination of all the strong features of these bills would be wonderful.

Now, the Ryan bill has some features which should definitely be included in the act—any act which Congress passes, which we hope will be this session. It provides for citizen suits if the Environmental Protection Agency fails to act against a violation for 60 days. And we think this is good because sometimes the agency that is in charge of regulating or looking after the public interest deals so frequently with the industries involved that they are supposed to be regulating, that as a general rule I think it's becoming almost a truism that agencies will ultimately fail to enforce the law vigorously against the people that they are dealing with. So we want to keep open the citizen suits in case that happens, and also as a supplement to Federal enforcement or State enforcement or city enforcement, for that matter, because when citizens are willing to bring some of these suits, it takes some of the load off the Federal or State or local agencies and reduces some of the taxes that have to be paid for them having to enforce it. Now, the reason that we want strong enforcement is not so we can put everybody in jail; it's so that everybody will know—so that the outlaws will know. There are outlaws in the field of pollution, including noise pollution—will know that they have to obey the law, or that they will have to suffer a penalty. And therefore they will comply with the law. As long as you don't enforce, well, then there will be some outlaws that will get by with it. And this is a disadvantage and an unfairness to the law-abiding persons who do want to obey laws.

Now, the EPA, they have brought a few suits in air and water pollution, and therefore I just have to project that unless, Dr. Meyer, you were an especially vigorous and mean man for a

Government official, why, I'm afraid that you wouldn't be able to get the powers-that-be to bring enough action in the noise pollution enforcement. And so we need this citizen action.

Also, the Ryan bill requires specific contract and procurement rules to insure compliance on noise control by Federal contractors, licensees and grantees. This is a good provision, and I hope that the panel will discuss shortly—I read where possibly you think that you can bring this about under the present powers, but it certainly wouldn't hurt to have Congress give you specific authority so that you wouldn't have any static on that.

Now, what good does it do, though, to enact a good Federal law or any other law, State or local, if we don't have the funds to put it into effect? Now, for example, on the Federal level the Office of Noise Abatement and Control was established under the Clean Air Act Amendments of 1970, and Congress appropriated a substantial fund for its operation. Well, now, the administration, the President, has requested only $1.15 million for fiscal year 1972. And this means that the Office would have to function on less than 6 percent of the amount now authorized by Congress. So unless it provides funds, all the talk by the administration about noise control is merely increasing the amount of useless noise circulating around this Nation.

We need noise legislation at all levels of government—now. We can amend these laws in the future as science develops more knowledge about noise. It is all right for our Government to finance further studies as is considered under the existing law, but we already know enough about noise to enable us to enact now the above-proposed legislation, which I have mentioned, and to enforce, now, the ordinances and statutes that are already on the books. The Environmental Protection Agency already has authority broad enough to require noise abatement equipment on items purchased by the Federal Government, for example.

So I hope that this series of EPA hearings on noise leads to some prompt Federal action to reduce current noise levels.

Dr. **Meyer.** Mr. Fritz, thank you very much. The first part of your discussion brought to mind the quotation from Lord Byron that I had called to my attention the other day by George Gordon. He said, in effect, that the peace and solitude of the mountains were wonderful, but the noise of the cities was intolerable. And from your comments it is evident, as many of us know, that the noise of man is intruding into the solitude of the mountains and the seashore to such an extent that Lord Byron would probably find it rather unpleasant today.

Before asking the panel if they have any questions, I would like to point out one thing, since I am responsible for administering the present law, to set the record straight on the question of funding. The administration did indeed ask for only the amount of money he mentioned, based primarily on our estimate of what it would take to write this report to Congress—which is all the law really calls for today—to hold these hearings, and to prepare, in effect, a program for implementation of whatever legislation

Congress enacts. We made a very careful study of how much money it would take to write the report and how much money it would take to hold these hearings. It was not a bureaucratic decision, "Well, you're entitled to $30 million; we're only going to give you $1 million." It was really based on an estimate of exactly how much money we would spend within the year or year and a half in which we were entitled to do it.

Mr. **Fritz**. I gather from that you feel that the new act gives you authority only to hold hearings and write a report and to recommend to the other Federal agencies what kind of equipment they can use. That's all you think you can do?

Dr. **Meyer**. We've had this explored pretty carefully by the General Counsel and, as shocking as it may seem, other than the very general authority that the Agency has, this is the only authority that the EPA has in the field of noise control at the present time. Thus there is a sense of urgency in the Congress about this. They recognize the problem.

Mr. **Fritz**. Yes. I've been surprised in how noise seems to strike a chord better than some of the other phases of environmental control.

Dr. **Meyer**. It seemingly does.

Mr. **Fritz**. And yet it was one of the later ones to really come on into blooming.

Dr. **Meyer**. Now, without further ado, panel, do you have any questions?

Professor **Cole**. Mr. Fritz, I have a question on your suggestion, on city ordinances and the citizens suits to encourage Federal enforcement agencies to perform in the matters so specified by recent legislation. In these arguments, did you intend for the idea of citizen suits to be included at the local government level?

Mr. **Fritz**. No. That is the one level where I doubt if, generally in most States, there is constitutional authority for the citizens to give that right. But possibly they could in municipal courts. But so far I have studied the State and Federal. I wrote the bill for the State of Texas, based upon the Michigan bill, and I do know that the State and the Federal Government have that authority.

Professor **Cole**. Well, this citizen suits provision, ultimately what it amounts to, it relies on the courts, the courts of law, to be the ultimate enforcement. And have you given any thought to some way to get at this kind of provision, access by citizens directly, but without crowding the courts?

Mr. **Fritz**. Oh, yes. Actually, you know, there are thousands and thousands of lawsuits brought in courts over auto collisions and divorces and all kinds of other things. Michigan included it, and now, in its almost 1 year of operation, they have had 12 lawsuits filed in this field under the citizens suit provision. And so this will have no serious impact on the courts whatsoever. The courts can take this on just like all the other matters that involve, in many instances, much greater technical expertise to be decided by courts and juries than this subject would.

Mr. **Berland**. I'd like to pursue that same point. Of course, you are probably aware that the new British ordinance provides exactly this provision, that any two citizens may bring a suit against a noisemaker. But, of course, if you are talking at the local level, then one would have to have some sort of legislation that would enable the citizen, such as you and me, to bring suit against, not only an airline, say, but also local people.

Mr. **Fritz**. Well, let me comment on that. The State law—we don't need a local law if you pass a State law. If it's pertaining to a suit by the State, it's in the State court. If it's pertaining to a suit by the Federal Government, it's in the Federal courts. And that covers all the courts. See, the municipal courts are subject to the State courts' rights. Now, of course, citizens already have standing to sue if they are injured in the current definition of what is a compensable injury, or if they are threatened to be injured under the injunctive process, the equity process. And so this is just an extension beyond the current type of injury. Now, the current type of injury, for example, in Texas, includes emotional illness if accompanied by physical illness. And those in the medical profession will have great difficulty drawing the line, but the courts have done it. But this does not yet cover clearly pure emotional illness. That is, if you don't show that you lost your hearing or you got an ulcer as a result of this, you see, and so such a provision for standing to sue on the State level and the Federal level would enable a citizen or citizens group to protect a community which, either from ignorance or fear, had no citizen who would go ahead and bring a suit for the injury.

Mr. **Berland**. Well, the problem, of course, is that one can sue now in the general category of nuisance. It's sort of vague and doesn't give much relief. One can also sue in terms of compensation for hearing loss, such as on the job, but again there are all kinds of roadblocks set up. And one of the severe road blocks in terms of the citizen is the cost. I think you will agree that we need some sort of technique in terms of the citizen, techniques for bringing such a suit.

Mr. **Fritz**. Yes. And the cost will be another factor that will deter a mass of this type of lawsuits, I'll assure you, because in one case in Texas where we prevented the State Parks and Wildlife Department from giving a free lease of land to a golf group to destroy a vital natural area in Meridian State Park, it cost us $3,000 to carry on that suit, most of the attorney help being volunteer, so that this had to be raised from a large number of citizens. Several hundred citizens put in $5 or $10 apiece, and $100 or $200 apiece to raise that $3,000. So we won't be jumping at every opening to file a lawsuit. It's a lot of work and a lot of trouble. Because oftentimes you are taking on not only an industry that is causing this noise or other type of pollution, but you are taking on a government agency who hasn't prevented it, you see.

Dr. **Meyer**. Thank you very much, sir. I assure you that your comments will be most useful to us, particularly several of the things that you just said. We have a responsibility for getting our legislation and developing model laws and ordinances. I made several notes on some of your thoughts here. They will be most useful to us. Thank you very much, sir.

At this point, I should like to invite Dr. Hal Watson, Jr., of Southern Methodist University, associate professor of mechanical engineering, if he would come forward and let us hear from him.

STATEMENT OF DR. HAL WATSON, JR., SOUTHERN METHODIST UNIVERSITY

Dr. WATSON. It's a pleasure to be here, Dr. Meyer, distinguished panel members. I have two statements which I have prepared, and I have given you copies. One is rather long, and the other one is rather short, and in the interest of the schedule, I'll stick to the short one and go through it in its entirety, and if any time is left over, perhaps read the abstract on the second one.

Dr. MEYER. Very well. And we will insert in the record, and use for our deliberation and study the entire text of your long one. Thank you very much.

Dr. WATSON. The title of the testimony is "Urban Planning For Noise Control," and since it is very short, there are many gaps, and I hope at the end we can fill in some of these gaps with questions, not only from the panel, but also from the general audience, if possible.

Generally speaking, noise control has been an afterthought of urban planners. Some noise control measures have been incorporated into the municipal ordinances but these do not usually require quantitative measurements of the offenders. Zoning ordinances are usually a little more comprehensive in that they require that industries not exceed certain noise levels, as measured in the octave bands, at the property boundary lines. While these noise control measures are beneficial, they do not get at the heart of the urban noise problem. Some of the major noise offenders are not included in the noise ordinances, these offenders being noise from transport—aircraft, trucks, trains, buses, automobiles, and pleasure vehicles. While no one of these is a particular problem for an urban area, the traffic density is the major contributor to community background noise. Because cities are in a position of attracting outside commerce, freely moving transport between cities and States is a necessity. It is therefore necessary for the Federal Government to control these noise sources. Construction noise is another source of noise which is largely uncontrolled by most cities during regular working hours and has been the cause of at least one major community protest, such as in New York City.

In many communities citizens and leaders are now seeing the need for noise control measures as the quality of life is being eroded around them. In the case of Dallas, interested citizens led by city officials worked hard to develop a new list of priorities for their city and compiled the needs and plans into a "Goals for

Dallas," recently published. In this document is a list of goals for the purpose of noise pollution control. These goals require research and study in noise pollution, implementation of a city noise control authority, and the writing of a new noise control ordinance. However, due to lack of the necessary funds, trained personnel have not been hired to implement these new programs. All of the major urban areas have similar financial problems.

Other noise control measures that are available to city planners, such as better routing and control of traffic, have been largely overlooked. In addition, little use of building codes having noise control design and material requirements to keep environmental noise out of living and working areas has been ignored for the most part, except near airports, and an example of this is the new Irving Airport zoning ordinance. Better land usage through proper zoning around airports, such as that proposed for the new regional airport by the airport zoning board, is needed.

It is difficult to plan without data and feedback. One severe need is for a systematic method of maintaining a continuous noise survey of the urban area to determine what needs to be done about the noise problems and to provide a way of determining the effectiveness of noise control measures. This could be done by means of permanent noise monitoring microphone stations, attached to telephone poles, transmitting noise data via telephone wires from many locations throughout the urban area to a central laboratory for analysis.

On the next page are some noise level measurements which I made in recent days in Dallas. As the levels indicate, Dallas, while not an extremely loud city, has need of the noise control measures discussed by the planners in the "Goals for Dallas." For the sake of comparison, New York noise levels, city noise levels, are much higher than these by as much as 10 dB(A). Average conversation, for reference purposes, is 45 to 55 dB(A). Speech interference occurs at approximately 60 dB(A).

For the sake of those who do not have the prepared text, the example of the noise levels is given. These noise levels were taken by an instrument similar to this one (indicating), somewhat more sophisticated and a little larger. This gives you an idea of the type of instrument that can be used to measure noise levels. It's priced in the neighborhood of $400 to $500 for this type of instrument and much more for the sophisticated ones.

One measurement was made at Hillcrest Memorial Cemetery. The deceased were enjoying a noise level of 46 dB(A), which I might add, would be rather pleasant in my home if it could be achieved.

On the S.M.U. campus, 55 dB(A).

A University Park residential area, 56 dB(A).

Central Expressway and Mockingbird, 75 dB(A).

At Bachman Lake near the airport, which is a park, 80 dB(A).

Downtown in a rather quiet period, 70 dB(A).

These levels were measured during a period, August 2, 1971, 10 a.m. to 3 p.m.

Peak values—These were average values here. The peak values were much higher. And I might add that it's quite possible to reduce these noise levels given by as much as 5 to 10 dB(A) by present technology, and perhaps more, and would certainly make Dallas a much quieter and more enjoyable city in which to live.

Dr. Meyer, at this point, I'd like to answer questions on the first statement. I'll let you decide.

Dr. **MEYER.** All right, fine.

Panel? Mr. Berland, do you have any questions?

Mr. **BERLAND.** Yes. I was interested in your statement that there were building codes which have rather stiff requirements near the airport. I was wondering how stiff they are.

Dr. **WATSON.** You are referring to Love Field, and I was referring to the new regional airport which is presently under construction, and certainly would not apply to Love Field.

Dr. **MEYER.** Well, one thing I'd like: If you could arrange to have somebody furnish me a copy of the "Goals for Dallas" that has this material that you mentioned in it, I'd like very much to have that for our reference.

Why don't you, at this point, give us a little of your abstract on noise control and then we'll see if the panel has any further questions and discussion.

Dr. **WATSON.** All right. The second statement is much longer than the first and is entitled "Noise Pollution Control" with a subtitle "Are our actions based on pertinent facts?" and I'll read only the abstract, and if we need to go into any one section, we can.

Dr. **MEYER.** Since I have glanced at this very quickly, would you also mind, on page 5 ——

Dr. **WATSON** (interrupting). Read the questions?

Dr. **MEYER** (continuing). Read the questions you have there?

Dr. **WATSON.** Yes, I will.

Noise is an insidious, pervasive pollutant which invades and degrades our environment. Although we believe we are, "getting used to it," noise causes us hearing loss and mental anxiety. Contrary to the popular belief, "noise is the price of progress," noise can be controlled. However, controlling noise means controlling technology and the technologists, who to the present time have enjoyed a great deal of freedom from such controls. Hence, action to control noise by social action groups usually meets stiff competition and the ensuing maddening political process leads to confusion with the involvement of the activists, politicians, business representatives, private foundations, news media, government agencies and the general public—all acting with insufficient information and communication and with much propaganda, allegations, and political pressure. Meanwhile, the people who have a great deal to contribute, the unbiased experts, for one reason or another, do not get involved. The panel is excepted. Consequently, the social issue is politically compromised over a base of insufficient information. Thus, a serious need is a national supply of technical experts with social consciences. This need could be supplied through education with sufficient government support.

The text, of course, goes into the abstract in a little more detail, and at the end I address two questions to the panelists for discussion.

One: What is missing in the educational programs of technical people which inhibits their voluntary participation in social causes which need their expertise so very much?

And two: What causes professional technical societies to be reluctant to participate in the resolution of social problems related to the fields of expertise they represent?

Dr. **MEYER.** Dr. Watson, you obviously realize that we could devote the entire remaining 2 days available to us for this hearing just to get into quite a dialogue and a discussion on those questions. It's fortunate, I think, that the panel has members of the academic community sitting here. And for about the next 5 minutes or so, I'd like at least one or two of my academic colleagues to address themselves to one or the other or both of these questions. I feel very strongly, as you do, that there is a problem here. The problem is not only what goes on in the educational institutions, but what goes on in professional societies. Perhaps part of it is the reluctance of the Government to intrude itself in these areas. I would welcome comments from any of the panel here on these two questions, which I think are very important.

Dr. **GLORIG.** As far as the medical profession is concerned, I think that this question is very well put, and I would like to compliment the gentleman on his bringing it up, because as a medical man I have had a social conscience about noise for somewhere in the neighborhood of 20 years. But due to the economics involved with respect to the interest of medicine, there isn't really much direct payoff with respect to this social conscience that I have developed. And my colleagues look at me as one of their poorer colleagues because their medicine provides more economic payoff than mine does. So I think really that when you look at this thing from the actual facts of the matter, the economics involved are considerable with respect to, all right, we have this social conscience. What do we get for it? Or, we have the ability to perform surgery to cure things. This is a known fact that we can get from it. So I know that in medical school the stuff that we had to learn is so much that some of these things that provide community spirit and civic attitude and social conscience, as you very well call it, are sort of left and relegated to the terminal ends of our education because the technical side of it is so involved and we only have a certain short time to live on this earth that we're in, and we don't have the time to learn some of these things that you're asking for because there just isn't time enough to get it. But I agree that medical people—and this is where I speak from—should be more involved in these community oriented problems. And I think that perhaps, with this kind of attitude in a citizens group, perhaps medical schools will give a look at not only problems involving noise, but the whole social conscience of the medical profession.

Dr. MEYER. Well, of course, one of the things you touched on, Aram, is that frequently the curriculum is so tight that there's not time available, taking into account the economics of going to school and paying for an education. There isn't time to assemble all the needed scientific and technical material needed and also all the rest of it. Maybe we have to take that into account.

Any other comments, panel?

Dr. WARD. What do you mean by "the rest of it"?

Dr. MEYER. The whole business of the total man, the life sciences, the social sciences. All too often—particularly in engineering schools, of which I happen to be a graduate of years ago, the pressure is on to do the things that are going to earn the buck, without recognition of the fact that the reason why you are earning the buck and doing these things is to aid man.

Dr. WARD. But I really don't know what—Would you encourage that all engineers take some courses in social work or something? This is a question. Social conscience can't be really trained into some of us, it seems to me, at the university level. It's something you have before you get to the university, it seems to me.

Professor COLE. I have difficulty with that term also. I would prefer social consciousness rather than social conscience, at the university level anyway. If you don't have a conscience by the time you enter college, you are not going to learn it by——

Dr. MEYER. I accept the criticism on that matter.

Dr. WARD. Could I say something about the second question?

Dr. MEYER. Yes, sir.

Dr. WARD. What causes professional technical societies to avoid taking stands? Well, I've been involved in professional societies who have taken stands on these social issues. And I think that the reason that the more technical ones don't is because these movements are so often led by fanatics who clearly do not accept evidence or deny evidence or present evidence as true which is still pretty ambiguous. And this is, I think, the reason you'll find that the technical societies try to steer clear from the social issues as a group, because there is not unanimity as to the facts among the members.

Dr. GLORIG. Well, I have a note which I wrote which agrees with that; it says that because of the inexactitude of the social sciences, the technical man sort of avoids that, which is what you are saying.

Dr. WARD. Yeah, I mean this whole question of annoyance, you see. It's difficult to pin down. You are going to have to spend time wrestling with it in these hearings and in any others. If I were out stomping on the lawn in the early morning it certainly doesn't have any high decibel rating, but if it wakes you up, it's annoying.

Professor COLE. Along that same line, I think you are very unlikely to find, as you term it, an unbiased expert.

Dr. WATSON. I thought that might bring somebody out.

Professor COLE. An expert is a person that is dedicated to a rather systematic way and approach to a problem and has rather rigorous and systematic methods of analysis and checking out truth or solutions. And I think that this inexactitude is alien to that person. I ——

Dr. **MEYER**. Well, I think—excuse me; go ahead.

Professor **COLE**. You opened up the floor to that question, and now you've got to pay the price.

Dr. **MEYER**. Well, I said for 5 minutes. We're counting now on our sixth minute.

Mr. **BERLAND**. Did you want a nonacademic comment?

Dr. **MEYER**. Yes.

Mr. **BERLAND**. I have been called a fanatic already.

Let me say that this business of inexactitude does not set well with me as a citizen. It seems to me the universities and the other institutions of higher education in this country have failed if they have not instilled in the people that they educate some degree of wisdom, and you can call it social conscience if you want. Because if they are only educating technical experts to make a living, a good living, with their expertise, then they have really failed because the university or any institution of higher education should also instill a little wisdom as to how to apply this for the good of man, and not just one man. And that's why I think we've got to get down to basics.

Dr. **MEYER**. I'm sure glad I put that 5-minute time limit on there. You can see, ladies and gentlemen, that our future hearings with the questions of physiology and psychology, and also the relationships between the various communities of interest are going to be rather lively.

Dr. Watson, thank you very much, sir. We appreciate the opportunity of your opening up this lively discussion here.

The next person to appear is Mrs. Roger C. Fletcher, representing the Arlington Conservation Council of Arlington, Tex.

Mrs. Fletcher.

STATEMENT OF MRS. ROGER C. FLETCHER, ARLINGTON CONSERVATION COUNCIL

Mrs. **FLETCHER**. I am really not representing the Arlington Conservation Council. I happen to be secretary of the organization, but it was because I was invited by the president to come to the briefing that I am here today, because I had a personal experience that I wanted to complain about. I presume you have a copy of my statement and it will be filed. I am speaking specifically of Public Law 91–604, title IV, section 402, paragraphs A, C, D, E, G, the specific portions. It's part of the attachment.

In great numbers, industrial employees defend themselves against work-produced noises and residents of urban areas protest the intrusion of transportation, industrial, and construction noises into their environment. But there aren't very many of us who can come forward to make a protest, to protect the natural sanctuaries against the invasion of unnecessary sound. Mr. Fritz has given several general experiences in the pursuit of "quiet," and I would like to give you one specific experience. If you will grant me the time to set the stage for my complaint, I would like to make a few introductory remarks about my husband and myself.

Since we are subjected for 50 weeks of the year to the pressures of urban existence, our vacations are nearly always spent in remote, sometimes almost inaccessible areas. It is, of course, that one twenty-sixth of the year spent in quiet, natural settings that rejuvenates us sufficiently to endure the following 50 weeks of turbulent cacophony in the metropolitan region.

For many years we have planned to walk to the bottom of the Grand Canyon, but have had to cancel or postpone our plans. But last fall we finally managed to make the trip. For several months before that time, during the summer heat of Texas, and last summer was a goodie, we ran a mile or more a day, either on the streets or at least uphill on the treadmill, and walked from 2 to 8 miles with boots on as often as possible, and survived that. Such conditioning was necessary for us to negotiate the steep downslopes of the Kaibab Trail, during which the route drops 4,500 feet in altitude over a distance of 7½ miles and to walk back up the Bright Angel Trail where the altitude is recovered over a 12-mile distance.

Those of you who have statements, one of the attachments is a map I have tried to redraw and emphasize, but it isn't very clear.

At any rate, we set forth last October to culminate the grandiose plans we had. Walking down the Kaibab Trail on a brisk fall morning brought on a feeling of exhilaration—I'm sorry about that "i" there—from breathing the unpolluted air, from viewing those tremendous vistas across the canyon, and from the feeling of near isolation, and also from the physical release of the exercise itself. Exuberant is what we were at that point, until we reached the Esplanade. At that time off to our right, we could hear the staccato racket that increased until we could see a helicopter chattering its way into the recesses of the canyon. That was our first irritant, although at the time it affected us only to the point that the occurrence deprived us of the possessive attitude that we had acquired towards the exclusively ours-to-enjoy trek separating us from the usual urban battering of sounds. Several times during the day we had a repeat performance, which at that time we really didn't let impress us too much.

The next day we chose to remove ourselves even further into the wilderness by walking the Clear Creek Trail above Phantom Ranch. Climbing a winding, steeply ascending trail for nearly a thousand feet above Bright Angel Creek, we had almost reached the base of Sumner Point when we were aware of a cacophony approaching us from overhead. Once more we sighted a helicopter making its way around the so-called temples and buttes just above the inner gorge. As it came closer we were aware that we were trapped in an acoustical chamber from which there was no escape without jumping over the edge of the trail, and we almost considered that. There was no place to run, there was no place to lie down, there was nothing to hide behind.

Our language—maybe it's only my language—does not have words which adequately describe the sounds produced by the machine at that point confined by the geologic formations both below and above. With no vegetation to speak of, there is nothing to baffle the reverberating sound waves. The flat, nearly vertical walls of the Brahma Schist, which forms the walls of the inner gorge, reflected the sound and funneled the waves onto the small ledge of the trail, physically battering us with sound. And at the same time, the upper buttes and pinnacles served as fracture chambers where the sound was cracked back and forth and amplified in the process, so to speak, from the reverberation. The intensity of the sound was not high enough to cause actual physical pain in the ear, but was sufficient in volume to disorient our balance until we were unsteady, and I wound up drunker than my husband. Some sort of term should be developed to describe another sensation. There were alternate pressure-and-release fluctuations in the sound which felt like paddles striking the ear drum but were immediately followed by a quick vacuum. Although I am sure it lasted only a minute or so, the disturbance was maddening until the helicopter moved around behind Zoroaster Temple far above us. I think the top of it was about 5,000 feet above us. We could hear the noises for a time as the craft proceeded along a route which seemed to include Brahma and Devi Temples.

And then the second time that we were attacked, we were positioned in a different resonance chamber. The fluctuating pressure and vacuum sensations were repeated and another one was added. The use of a metaphor like "chopper" really has a legitimate origin. The sound returning to the "chopper" was literally chopped into fragments and hurled back at us like shrapnel. These noises created near hysteria in anticipating what lay ahead. The trail at that point was only about that wide (indicating) with the trail sloped above and below us at about a 45° angle. And I knew I could not negotiate that trail any further if we had any more helicopter attacks. And noting the number of helicopters we had seen the day before, we presumed that we were right in the path of their route, and we just had to give up on getting over to the Clear Creek Trail.

Now, I would like to insert that I am not unaccustomed to noise. My husband has been in aircraft, from student to production, flying, for 35 years. In addition, our house is under the intersecting flight circles of the Great Southwest Airport, the Arlington Airport, and the Grand Prairie Airport. I think this does establish the fact that I am not unduly sensitive and not a crochety old woman.

Naturally, at this time our interests were concerning our own, but we did wonder about the animals in that canyon being affected by the numerous periods of strident sound inflicted on them. Was the sound greater along the trail? Had the wildlife adapted to the harassment? Or had they all moved to another area? Or had they acclimated themselves to the timing of the invasion and move about only during off hours for the helicopter tours? Or had they ceased to exist?

We turned back to retrace our steps down to the Phantom Ranch, and still another helicopter came in close overhead and prepared to land on the gravel bar on Bright Angel Creek. Irate at the shuttle service to the bottom of the canyon while we had walked down anticipating a cloistral retreat, I girded myself to let loose a blast of my own. The passengers in the chopper were National Park Service personnel, so it was evident that my selected phraseology would fall upon deaf ears. They did tell us, though, that the men were bringing in some sort of meteorological equipment which was too difficult to send down by mule. There was no shuttle service; only authorized, by National Park Service officials, trips could be made by helicopter to Phantom Ranch at a price of $120 per passenger, and the flights were usually limited to emergencies. We could not talk to the ranger at the station because it happened to be his day off, but others at Phantom Ranch assured us that the Park Service didn't have the authority to prevent the sightseeing craft from flying above the Grand Canyon although they were to stay at a considerable altitude when over the Bright Angel and Kaibab Trails and to limit the lower elevation flights to the area east of Bright Angel Creek, which was in fact where we had observed them.

I have added, as part of my documentation—and this is really valid documentation—an advertisement from the helicopter company showing the route that they fly. However, it is not exactly accurate because they do make loops up around Brahma Temple instead of turning left and going down the river to the temple.

Then we staggered on down to the Colorado River to eat our lunch and found three inflated rafts there, part of them with passengers in them. The river runs always stop there for lunch, we understand. Two of the crafts were powered and the third was not. The one craft was conducting feasibility tests to determine if it was safe to continue river runs without auxiliary power units, because, it was explained, all float trips had to be unpowered within 2 years because the noise interrupted the solitude. Now, this explanation was incredible to us, for what little sound the floats made could seldom, if ever, be heard above the thundering, rumbling, cavorting river noises. We couldn't even talk to each other, just in sign language, alongside the river. But it is an incongruous situation. The river trip would have to be unpowered if it was found that it was feasible to do so, while we up on the trail had to give up because we were getting drunk from the helicopter invasion. Now, this statement is hearsay. We do not have any documentation except the slides that we took showing that two of them were powered and one was unpowered, and just the hearsay statement that this was the conversation.

But it is obvious that I have outlined the conflicts of interest which now occur over the use of recreational areas. Where can the line of demarcation be placed between the rights of those who desire near-solitude without danger of intrusion versus the rights of others to seek recreational pleasure while penalizing the former group?

And, of course, in this case I think I have a big solution. I am positive that I have earned the right to escape for that one twenty-sixth of the year by withdrawal from the impacted community into the calm environment of remote recreational areas. What right have others to pursue me in a mechanical monster to rob me of the benefits of my own endeavor? In my opinion those sightseeing trips should be declared a public nuisance and eliminated immediately. Most of the wilderness areas should be afforded the same protection, summer and winter, and noisy machines be permitted only in emergency cases.

And just this past week I read an ad trying to get a group of people together in the wintertime to take snowmobile trips into wilderness areas. But this type of experience is already, I think, under the control of the Federal Government and National Park Service. And before the helicopters get any bigger—and my recent issue of "Winter Gateway" states that they have added huge 500 helicopters to these trips, so we'll have a real doozy of a sound experience down there in the canyon now.

This is an opportunity, of course, to present our complaint to your group, although for this particular one I had to go outside the State to find. But it is evidence of citizen and government interest in the psychological as well as the physiological hazards of noise proliferation. And how long will it take to achieve a rational balance between progress and preservation? Where can the line be drawn between the objectionable and damaging noise and noise that needs to be tolerated in the benefit of the Nation as a whole? It is hardly likely that those who are committing the acts which generate the damaging noise will voluntarily cease their operations, so their activities can become the problem of groups like yours which must collect, evaluate, and propose and support legislation which will define the privileges and regulate the prerogatives of those bent on leisure time activities. I think that this report of mine is valid when considering the critical point between sanity and insanity brought on by urban compression. With your reports to the executive department and Congress, of course, we hope that legislation can be formulated and passed which will hold noise to a level consistent with a tolerable existence.

Thank you.

Dr. **MEYER.** Mrs. Fletcher, thank you for bringing this to our attention. Before I make a couple of observations, I'll ask the panel, does anybody on my left have a comment?

Dr. **WARD.** Well, yeah. I'd like to make a comment that your example illustrates the difficulty of passing good regulations. Because if you just ban all internal combustion engines in all national parks, which I don't think would be a bad idea, you would be getting rid of these powerboats in the Grand Canyon, and it really isn't necessary. So you see, it's very difficult, unless you judge each case on its own merits, to pass a good law. But in my area, which I'm more concerned with, being from Minneapolis, motorboats there, I'd just as soon see banned. But on the Colorado, as you say, the noise from the water itself is so thunderous that the boats don't make any noise. And my point is, that it's very difficult to pass something that is sensible in all dimensions.

Mr. **Berland**. It sounds to me a little like, from the testimony, that maybe the Federal Government ought to set aside national solitude areas as well as national parks.

Mrs. **Fletcher**. If it's above, though. If it's above, how far up does your authority go? We, of course, were not allowed to leave any trash along the way. We had to carry everything in and out. In fact everything from Phantom Ranch is carried out by muleback, all the tin cans, all the trash and the glass. And this is very consistent with remote solitude, undisturbed areas. But how far up does it go?

Dr. **Meyer**. Mrs. Fletcher, and members of the panel, I think you'll all be interested in knowing that my office, actually the Environmental Protection Agency, has a contract on some very sensitive studies on noise problems in the Grand Canyon. This problem had been called to our attention, but not in the clear and specific terms you have presented it. Arizona State College, under a grant from us, is doing some instrumentation, and we are working with the National Park Service to try to get this thing taken care of under our very limited powers.

Also, may I ask your permission to do one thing? We are having a hearing on recreation problems in Denver and I would like to insert your statement in the record of that hearing also, if I may.

Mrs. **Fletcher**. Would you, please. I'd appreciate it.

Dr. **Meyer**. Thank you. We'll now proceed to testimony from Mrs. Franklyn Wright. Mrs. Wright, welcome to our gathering.

STATEMENT OF MRS. FRANKLYN WRIGHT

Mrs. **Wright**. I wish to thank the Environmental Protection Agency for involving us in these hearings, because so often recommendations are made and standards are set and laws are passed, and the public is not involved and has no real knowlegde of what we, as citizens, really want. And through these hearings the EPA has become the public ear through which we can all be heard, and we are very grateful.

Dr. **Meyer**. Thank you, Ma'am.

Mrs. **Wright**. And I was just going to speak very briefly on noise and on trees as one of the solutions to the problem. And if I can, quote just a very brief little thing from John Greenleaf Whittier.

"Spirit of the forest, drop Thy still dews of quietness
Till all our strivings cease;
Take from us now the strain and stress,
And let our ordered lives confess,
The beauty of Thy peace."

The public has always been concerned about the breaking of the peace, wherever they are indicated And way back when, Julius Caesar banned evening chariot joy rides because they were keeping the people awake. And to date we haven't improved much, and our chariots are even noisier. We are the noisiest generation in history, a whirring, clatterous, continuous motor becoming our true national symbol.

Noises everywhere; down in the Grand Canyon, factories, hospitals, homes, and of course, in homes it's really sort of continuous with all of our mechanized devices. But you know, they don't seem to bother us too much; it's our neighbors noises that bother us. We are more concerned about our neighbors mowing the lawn than we are ours. And of course, even in the wilderness. Today the shattering shock of the sonic boom and the arrumparoom of the most dinsome, racketal pandemonium of all, the motorcycle. My son just bought one; that's why I'm so mad about it. But they negate the peace of the general area. We should probably have a national solitude area. And of course, we are going to discuss a lot of things tomorrow that are a little more technical, the psychological effects of continuous racket. The ultimate, of course, is madness. The physiological effects, which are not yet completely understood in detail except for hearing loss, where the ultimate is total deafness.

But the alarming fact is that our world is becoming noisier—city noises probably increase one decibel each year. For laymen like myself—and I'm sure no one needs a definition except me—one decibel is the weakest sound the normal human can detect, eighty decibels are considered loud, one hundred deafening, a hundred and twenty dangerous, a hundred and forty extremely painful, and a hundred and sixty can kill small animals.

And since some areas are already dangerously high, any increase, even one decibel a year, can be extremely dangerous. To ignore this danger is like the optimist that fell ten stories. At each window bar he shouted to his friends, "All right so far." But we're not ready for that yet.

Technical solutions will be described in detail tomorrow. Today I should like to discuss one rather simple method, the preservation of trees.

In addition to being "As lovely as," trees are manufacturers of oxygen, utilizers of carbon dioxide, air purifiers, food suppliers, preventers of stream siltation, provide food, windbreaks, cooling shade, soil conservation, watershed protection, wildlife habitat. They also serve us as sound barriers against traffic and industrial noise.

To a large extent we in Dallas have not utilized this natural resource. Too often developers will bulldoze a forested area, build their buildings, then plant young trees which may take fifty or more years to equal those destroyed. Too often our Public Works Department, in the name of flood control, has demolished countless numbers through channelization, a flood control measure which usually rushes water through faster, creating additional problems downstream. For these, and many other reasons, our trees have been slaughtered, a loss of not only shade and beauty, but of actual anti-pollution devices.

The Agricultural Department says a 3 year study near completion indicates unwanted noises can be cut as much as 65 percent if trees and shrubs are used as barriers. This is a high percentage, and I'm sure would be only through the use of the shelter belt, the thick leaf plant, as opposed to trees. Trees are good as noise barriers, but the 65 percent would probably mean very thick rows.

And I do believe the members of the Dallas City Council recognize this use of trees, and I hope they will soon pass an amendment to the city code to protect our trees. And I am sure the EPA will include tree preservation among their various recommendations for noise abatement.

Dr. **MEYER**. Thank you very much. As a matter of fact, tomorrow a representative of the American Institute of Landscape Architects is going to discuss this very subject in some technical detail. Panel?

Dr. **NEWMAN**. I'd like to comment. I'm a great admirer of trees; they are marvelous. Unfortunately, they don't do anything to noise. This Department of Agriculture study is bunkum.

Mrs. **WRIGHT**. Oh, is it? That's where I got it from.

Dr. **NEWMAN**. I know. I've read it, and I've written the guy down at the University of Nebraska. It's very sad, but it's just bunk.

Mrs. **WRIGHT**. Well, I have some other sources quoting trees—now, that one may be.

Dr. **NEWMAN**. Let me tell you a little story.

Mrs. **WRIGHT**. OK.

Dr. **NEWMAN**. In Boston, the Boston Edison Company has transformers that serve neighborhoods, and they put them out in residential areas. And they had one transformer that was surrounded by a cyclone fence with barbed wire on top. A railroad track was right behind this group of transformers, a main road ran along here, and then a row of houses stood here. And a lady in one of these houses said, "You've got to stop that damn transformer; it's making so much noise it's keeping me awake at night."

So we were hired to go out and look at this noise, and we found that at about 2:00 in the morning, indeed you could hear this transformer out in front of the house. So we recommended a very elaborate noise control procedure, which was to build a building around this transformer and put in ventilation and so on. The company said, "That's too expensive; we are going to plant some trees."

We said, "It won't do any good."

They said, "We are going to plant trees anyhow."

They did. They planted one row of arborvitaes around three sides of the transformer. Of course the railroad track didn't matter because the trains weren't complaining.

And the lady said, "Oh, thank you, Boston Edison. The noise is all gone now and I'm so happy."

And then they said, "Now, you guys said it wouldn't do anything. Go out there and measure it again and let's see."

So we did, and indeed the noise hadn't changed a speck. Out of sight, out of mind.

And I think that the benefit from the trees in cutting out traffic noises is considerable in terms of "out of sight." But unfortunately, you get very little benefit. When I tell you it doesn't do anything, it's quite accurate. But even a half a mile or a mile of woods does very little. I don't want to be all negative, but that's the way I——

From the **AUDIENCE**. An arborvitae is not a tree; it's a sort of a hedge.

Dr. **WARD**. I think that Mrs. Wright, in something she interjected, said something that we should keep in mind. It's the noise of others that annoys us; it's not the noise we make ourself, which may be obvious to everyone. And yet, this means that it's not the noise per se that's annoying; it's the fact that it's made by somebody else. And as I think about it, I don't really mind hearing a jet plane passing over when I'm up in the wilderness in Ontario half as much as I detest meeting another group of hunters. I think that I'm off away from everyone, and the fact that they are there really makes me mad. But the jet—well, OK. that's the price you pay for civilization. I think that this is the whole point. We're just getting too crowded, and our concern with the annoyance value of noise may be inevitable. I mean, if it wasn't the noise aspect of our many neighbors, it would be some other aspect of their simply being there that would bug us.

Dr. **MEYER**. Well, perhaps what you are saying, and what Dr. Newman said, and also what Mrs. Wright was saying with reference to the other aspects to the tree problem, and perhaps—I'm not going to try to prejudge the Institute of Landscape Architects tomorrow—but perhaps it is the combined effect of visual contact and auditory contact. When you reduce some of the visual contact, perhaps the sensory mechanisms of the brain operate in such a way that the harsher reality of the noise is reduced somehow. This is one of the things in our research program that we hope to undertake very shortly, and we hope to investigate to some length. Any other comments? Thank you very much.

Again, we are getting a little stimulation of some cross-conversation here that's most useful. Thank you. We have two other people scheduled for this morning, and rather than taking a short break at this point, I will go ahead and ask the remainder of the morning witnesses if they would go ahead, and then we may possibly be able to end up a few minutes earlier and have a slightly longer lunch session, which, with all the other activities going on in the city, may be desirable.

Is this agreeable, now? Well, in that case, I should like to invite Mrs. Robert Sapp of the American Association of University Women if she would let us hear from her. Mrs. Sapp.

STATEMENT OF MRS. ROBERT SAPP, AMERICAN ASSOCIATION OF UNIVERSITY WOMEN

Mrs. SAPP. Do you all have copies?

Dr. MEYER. Yes. Thank you, Ma'am.

Mrs. SAPP. By way of introduction, I'm Mary Sapp, vice President of the Dallas Branch of the American Association of University Women, and I'm also chairman of the environmental group.

I believe, Dr. Meyer, that one of our women testified in Chicago.

Dr. MEYER. Yes, she did, and gave a very nice presentation.

Mrs. SAPP. So I am speaking for a very, very large group. I don't have too many personal observations to make.

In June of this year the American Association of University Women held its national convention here in Dallas. At that time more than 1,200 delegates who were in attendance adopted a Federal legislative program. Included in this program was the association's very strong support of measures that will conserve and improve the environment, particularly the control of environmental pollution.

It is in keeping with this program that I submit these views to you.

In preparation for this testimony, I felt it necessary to gather some first hand information. And, unlike that heard from other testifiers, I did not have to go out of my kitchen. I would like to treat you to the noises of my kitchen.

(At this point a tape recording was played by the witness.)

Can you hear it?

I think probably you've had enough.

I think the saying should be, "If you can't stand the noise, get out of the kitchen." It would seem that appliances and machinery are designed with noise in mind, the more power, the more noise. And one does not have to be an expert to see that the noise levels are on the increase and that we are being bombarded and assaulted with noise from all directions. But unlike the air and water pollution, noise pollution is not visible and does not usually remain for extended periods. Therefore, I think the public as a whole is unaware generally of the problem. Ironically, noise pollution often acts so subtly on the human mind that it has gained a form of acceptance as an inevitable byproduct of technology and progress.

In the report to the President on Noise Abatement, Dr. Vern O. Knudsen, acoustical physicist, states that the loudest noises to which we are exposed have increased some 20 decibels in the past 20 years, and if this rate continues for another 20 years the noises will reach the lethal level. Authorities agree that permanent hearing damage can be caused by exposure to noise levels over 85 decibels for extended periods and such damage is not likely to be noticed until too late. It is significant to note now that city traffic levels register 90 decibels, subways a hundred decibels, motorcycles 120, jet planes 140, with many of our factories, construction sites, and kitchens ranging about a hundred decibels.

Although sound is easily measured, its effects are not. However, it is generally agreed that the extreme noise can endanger health. property value, buildings, and the general quality of the environment in which we live.

Medical studies here and abroad report numerous effects of noise on the human body. These are: Increased level of cholesterol in the blood, constriction of blood vessels, higher blood pressure, dilation of vessels in the brain causing headaches, increased flow of stomach acids, and provoked emotions. Because the human ear cannot be turned off, noise even affects people during their sleep. In laboratory animals the results of prolonged exposure to high noise levels are very dramatic, ending in heart failure.

Courts have acknowledged the existence of noise damage by awarding compensation to workers claiming hearing loss caused by their jobs.

The Veterans Administration pays $8 million a year in claims to service men whose hearing has been damaged by gunfire in training and combat. According to the chief audiologist at Walter Reed Medical Center, more than half of the 500,000 men who receive military combat training each year suffer a significant hearing loss.

The World Health Organization estimates the cost of industrial noise at $4 billion annually, this resulting from accidents, absenteeism, inefficiency, and compensation claims. Mental illness and irritability, although unmeasurable, are surely enormous. The psychological effects of noise should not be understated. Annoying and uncomfortable sounds can lead to poor functioning and to instability of the population.

Material damage from high noise levels is also considerable. The Air Force paid $115,112 in the fiscal year of 1969 for sonic boom damages to 814 complainants. More than $6 million in claims were filed. So here again, a lot of people were hurt who didn't win. In 1968, when the Air Force fighters swooped over the Air Force Academy during graduation exercises, $50,000 worth of windows were broken. In the cases of material damage, however, reparation can be made. This is not the case with hearing loss or psychological damage.

What is being done about all of this? The United States has no general antinoise legislation. Although in 1970 the Federal Government allocated $32 million for noise control, $29 million of this was spent on research of aircraft, leaving very little for study of other transportation and noise sources. The Federal Aviation Administration recommends quiet construction techniques, but such countries as Canada, Great Britain, West Germany are way ahead with national building codes. European cities had standards 30 years ago. Although the Federal Aviation Administration allows only a maximum of 108 decibels, I believe, now for new airplanes, instead of the 120 decibels, there is no regulation of military planes or surface transportation. With a projected U.S. population of 300 million for the year 2000, with four out of every five of that projected population living in the cities, with 70 million cars on the road now, with traffic noises registering 90 decibels in large cities, and with a projected figure of 1,420 flights daily in 1980 at our own regional airport, we can no longer wait for action that will alleviate our present noise problems and prevent further noise pollution.

Obviously our noise control is far behind our technology. But we do have the expertise to decrease and eliminate most of the excessive noises around us now. By way of example, noisy machines can be enclosed and insulated, streets can be cut below grade so the noise won't be as loud, airports can be built away from population centers and can have buffered zones; proper construction techniques can soundproof buildings and dwellings, and machinery can be designed with built-in sound depressors. General Motors has already developed a quiet garbage truck; Bethlehem Steel has developed a noiseless metal garbage can; Ingersoll-Rand has a whisperized compressor; and the United States has silent submarines. So technology can do these things. We are not asking that they erase all these marvelous machines, but build with noise in mind.

Where does this leave us? Well, we have the method and the means, but we don't have the motivation. We fail to see that noise has replaced quiet as an American value. And we feel that technology should support American values, not undermine them. The burden falls on everybody; it falls on the public, who is going to have to demand noise control, and on the engineers and technologists who can design for noise control, and on the Government officials to enact regulations and set standards. We hope that this hearing and other public hearings will provide that motivation. And we strongly urge active Federal legislation and ordinances now to control and improve noise levels.

Thank you very much.

Dr. MEYER. Thank you very much. Panel?

MR. BERLAND. (Playing tape.) That's my dishwasher.

Mrs. SAPP. Mr. Berland, I'd like to thank you, and I'd like to make a comment. When I was trying to gather some facts, I found a real dearth of material in noise pollution, and this struck me—because I have done research on both water and air pollution, and it's so much sometimes that you can't cover it all. But I think you will agree that there's very little on the noise problem that has been written and substantiated today.

Dr. **Gloric.** Well, I think I would disagree with that. There is a lot been written, but very little substantiated.

Dr. **Meyer.** I was going to venture the observations that a great deal has been written, and also that a lot of it has not been substantiated, and that a great deal has been written that's so highly technical that the general public has not had a chance to really evaluate it. Could I ask one question of you, if I might, before we proceed to the next witness? This question of noise in home appliances is something that some of the industry people are going to talk about tomorrow, about what they think they can do about it, and what they are going to do about it, and what they have been doing, and what it will cost. I'm not trying to embarrass you with this question at all—but as a typical individual with knowledge of this in the environment, was there anything when these items were purchased, did the thought about noise or noise control at that time enter into your decisionmaking? And again, I'm not trying to embarrass you.

Mrs. **Sapp.** It does now, in that I don't like to run my blender, and I almost refuse to turn on the kitchen fan. And my husband, who comes from a noise level of about 50 decibels to a kitchen of 100 with kids screaming in the background, I think this is a considerable concern now. I don't think that this was a concern before we had so many. One is all right, but you put on two or three and it's incredibly bad.

Dr. **Meyer.** I think that's the point I was getting at.

Mrs. **Sapp.** And our houses here in Texas are so wonderfully designed that the kitchen is right next to the den, which has all of the noise units in it, the television, the hi-fi and the drum sets. And daddy walks in the back door and wow, you know. So I think maybe—I can't say this medically, but your stomach acids do flow.

Dr. **Gloric.** I am sure of that. Mine do too.

Dr. **Meyer.** Thank you very much.

Mrs. **Sapp.** Thank you for the opportunity.

Dr. **Meyer.** I'd now like to invite Mrs. C. M. Thompson, who has indicated a desire to make a statement. Mrs. Thompson, are you here?

STATEMENT OF MRS. CHARLES M. THOMPSON

Mrs. Thompson. I live at 4311 Vandelia, and in my block there are seven men. Most of my friends have lady neighbors, but I have seven men that live in my block. And this one was kind enough to —he didn't think I could come. I didn't think there was anyone who could read my handwriting. Anyway, this is it.

I am a widowed homeowner at the above address, 4311 Vandelia, Dallas, Tex., and wish to submit my testimony of our need for noise abatement and control as follows:

I have lived at 4311 Vandelia Avenue for 46 years, and Love Field, now the main airport of Dallas, is several miles northwest of my home. My home is under the path which nearly all departing planes take from Love Field in the summer. And one can drive right up Cedar Springs Road from my home directly to Love Field.

July the 20, 1927, I gathered my two children and went to Love Field to see Col. Lindbergh, fresh from his epochmaking solo nonstop flight from New York City to Paris, France. There was an immense crowd at Love Field for the welcome. And we Dallasites were then hopeful we would see many more airplanes using the field.

Our hopes have been realized. Dallas airport is now a major one of the United States. But alas, the noise.

And I want to say, too, that when Col. Lindbergh gave his talk, they said that was the last hero—he would be our last hero. Well, I don't think the astronauts would appreciate that.

Now, during the last 15 years or so, the noise of jet planes over my home, one every few minutes, night and day, is deafening. It interferes with my telephone conversations and my enjoyment of my television, and makes it impossible to have the garden parties we used to enjoy so much. One can shut out the noise when in one's home by using air-conditioning, but I, an ordinary resident, am not wealthy enough to build an air-conditioned dome over my house and garden like the Astrodome in Houston, as some extremely wealthy persons elsewhere have done. So I must suffer on.

Much deafness has been caused on my block on Vandelia Street and on the next street, Hall Street. Forty-five years ago I was in the youth of old age. Now I am in the old age of youth, living on the savings of my dear dead husband and that relatives have left me. There has been no deafness in my family. My sister, 85, has never lived around airplanes, and her hearing is perfect. But now my hearing is becoming impaired, and as I say, my enjoyment of my television and my garden is spoiled, and even my phone conversations with friends are being interfered with by the noise. And thus I am being deprived of even the meager pleasures of old age.

Now, it's not only just with friends. The other day I was talking to the bank for my brother-in-law, who is an old, old man. I was looking after him, and I wanted to see that he got more interest. He said, "You'll have to put it in for a certain number of years."

And I said, "All right. Put it 1972." Because I didn't want to put his savings where I couldn't get to it when he needed it. And they put it 1982, and sent me a notice that they had done that. It's not 1982, it's 1972. He and I won't even be alive by then.

But anyway, there a lot of things like that that take place.

Please, Dr. Meyer, won't you and your organization help us to abate this blight before it is too late.

Thank you for this opportunity to contribute my widow's mite.

Yours truly, Marie Thompson.

Dr. **MEYER.** Now, your widow's mite is received most gratefully.

You have highlighted in some very distinct words what part of the annoyance problem of noise is—the interference with the desire to have occasional recreational activities and the ability to innovate. And I think it was a very fine, public-spirited action for you to come in yourself and do this. Panel?

Mrs. **THOMPSON**. Well, I think it's time to come because, you know, old age has its compensations. And I'm not overly sensitive to noise. I have eight grandchildren. No, six, and two great-grandchildren.

Dr. **MEYER**. So you do have some tolerance to noise. I understand what you mean. Thank you so much.

At this point, then, I would like Mrs. Henry Richardson, if she is here, to come forward and let us hear from her. It's nice to have you here, Mrs. Richardson.

STATEMENT OF MRS. HENRY RICHARDSON

Mrs. **RICHARDSON**. Good morning, Dr. Meyer and panel members. I am very grateful to you people for bringing this hearing to Dallas and giving us the opportunity to appear. I do not have a written statement because until yesterday afternoon it was doubtful that I could come.

I live a little way from Mrs. Thompson, but not quite so close to Love Field. I live at 3323 Blackburn Street, which parallels Lemmon Avenue, across the street from the Theater Center and the high-rise apartment known as 3525, and unfortunately is in the flight pattern. My family has lived in this block, in this particular block, since 1889, so we certainly preceded the airplane.

Last night when you were on Channel 13, and one of the feedback questions, a pilot's wife called in and said, "Why do people move into the area of airports?" Well, we were there first, as were many other people. This area was completely developed. So this is not quite fair. We are, I would say, at least 4 or 5 miles from Love Field. I'm not particularly susceptible to noises, I'm not cranky about noise. There is a railroad track near us, and I grew up there. The railroad has never bothered me. And it isn't just seeing, because the jet noises are certainly not visible. I realize that some urban noises are unavoidable, and since I choose to live in an urban community, I am willing to put up with many urban noises, but I do feel that much of the airport noise could be avoided. I'm not an expert, but as a lay person, I would like to give my ideas and see if some of these are legitimate.

As for home appliances, which one of the ladies mentioned, we have a choice. We can either cut them off or not buy them or run them. We have no choice about listening to the jet planes. At some times of the day—and unfortunately, you have been on at least twice that I know of since you reached Dallas yesterday; you were on channel 13, which I always watch at 6:30; you were on News Eight, et cetera, this morning at 7 o'clock, which I always watch. And those are the two times of the day—I'm not an inveterate TV watcher; I watch the news and then I cut my TV off. But those are the two times of the day when the planes are almost incessant. Before the sound of one dies away, another is in the air. Now, if it happens to be an extremely hot or an extremely cold time of the year and we have our room air conditioners on, it partially drowns out the noise. But during those lovely times of the year to which we all look forward, spring and autumn, the jet planes make life unbearable for us. This is not simply psychological; this is a matter of practical living.

The weather report will come on and I will listen carefully to see if it's going to freeze tonight, if I need to cover some tender plants or if I need to take precautions about the plumbing, or how cold it's going to be. Just as he gives the minimum, unless I happen to be looking at the screen, the plane comes over and I lose it. I'll listen maybe to a joke, and just as he reaches the point, I lose it. I never know the point of the joke. I can live without that, but I'll always wonder how it comes out. I'll call friends who don't live in the flight pattern and I'll say, "Did you hear so-and-so? What was the point of that joke, because I missed it?"

And on the telephone, I have to put my hand over the mouthpiece to keep the person on the other end from being drowned out, because it absorbs the sound of the plane going over. We can no longer entertain in the yard. Our son and daughter-in-law, who live about a block from us, are a little hardier stock than we are, and they still have their cookouts in the yard. If we try to cook out in the yard, we beat a hasty retreat into the house to eat it, because it's not pleasant to try to talk. We can stand as close as I am to this microphone and be unable to be heard over the sound of the plane. And until you have been through it, you may not believe me. But it is true.

There are other little inconveniences. We have an intercom system. Our property goes farther than the sound of our voice will carry, so we have an intercom system so I can call my husband or some of the family to the phone, or if I need to get in touch with them. I can't use that intercom system because the planes, at certain times of the day, are so noisy. This intercom system, I can turn it on in the kitchen—the main station is in the kitchen. All the stations around our place are always on. When I turn on the kitchen, everything else is on, so it picks up any sound anywhere in the yard. I can't bear the sound of that in the kitchen because it picks up the airplane noises. Several times my husband has started out the door, the telephone has rung, and it's, "May I speak to Mr. Richardson?" I run to the door and call him, and he goes his merry way. He can't even hear me. And I run a racetrack procedure to try to grab him and to touch him so that I can get him back, because there is a plane flying overhead.

And you wait—you are standing there talking to someone, and you wait for this plane to go over; it does you no good. Before the sound fades away, there is another one coming at certain times of the day. The Theater Center goes through it, North Dallas High School goes through it, Rusk Junior High School goes through it.

Now, North Dallas was built before the jet plane. I listened to Dr. White, who was then superintendent of our Dallas Independent School of District, make a talk to the PTA at Rusk Junior High, and he had to stop several times while he was speaking. And he said, "I've often wondered why we built this school where we did." For the information of the North Dallas people, Rusk Junior High is about, I would say, 2 miles from the airport, about halfway between our house and the airport, maybe a little bit closer to the airport than our house. My child went to school there. These residences, as I say, were established long before the airport came. Now, what it is doing to areas like this, it means a steady deterioration of these parts of the city. The planes that are taking off seem to give us more trouble than the planes that are coming in. I assume that it's because they have more power. I have traveled quite a lot on jet planes. I traveled over the Pacific in a jet plane, and passengers would not tolerate the noise that the person down below has to tolerate. And this is unfair, because many more people are affected by that jet plane as it flies overhead than are inside the jet plane.

I am wondering, that since the major portion of this comes in the early mornings and the late evenings—and I think Mrs. Thompson lives somewhere near the flight paths, so she knows what I'm talking about—I'm wondering if these flights couldn't be routed over areas that are primarily business or industrial, that are not heavily populated at that time of day. And besides that, they are generally filled with buildings that are insulated and buildings that don't have open windows and outdoor living patterns that would not be so seriously disturbed and upset by these patterns. Many of these planes that take off over our place —we live south of the airport, and my friends who live north of the airport don't have this trouble—many of these planes go across to Southeast Dallas and then veer off in another direction. So we get not only the southbound planes, but the eastbound planes, and I'm afraid some of the planes even that are westbound. Although the planes that I have seen westbound did not go over our house, but I think some of them do. Or I'm wondering if they could not climb more rapidly in their takeoff patterns. It seems to be that there is a great variance in the altitude at which they pass our house—go over our house. And these are technical matters which I am not competent to decide upon. But just as a lay observer, I would like for some of you gentlemen to understand what we have to go through and consider it. Sometimes a person who is standing down there on the ground, who is perhaps not technically equipped to answer these questions, may have some very simplistic thing that isn't so foolish after all.

Now, I'm wondering also about future development. We own property, we own acreage which is about two and a half miles from the new regional airport. There was an article in Sunday's paper, which I will leave with you gentlemen, which was signed by Gloria Brooks, which is an assumed name. But it points out very briefly: "While construction proceeds smoothly at the Dallas-Fort Worth Airport, a source of real concern is obtaining commercial and industrial zoning on the borders of the huge facility. Towns and cities bordering the airport reportedly may be inclined to zone for other uses. This could mean residential development, noise complaints and other headaches that the airport hopes to avoid."

Now, I have no axe to grind in coming here; I simply come as a citizen. But I do know from personal experience because within the last 2 weeks the city in which our property lies is trying to purchase or acquire part of it, perhaps through eminent domain and condemnation. And in this process they are trying to convince us that it isn't worth very much money after all. And they have told us within the last 2 weeks that we could never hope to get anything more than single family zoning for this property. We haven't asked for any zoning at all. The property is not even on the market. But this is being used in many communities, I'm sure, as this column points out by speculators and by persons who have contact with some of these city officials. On one side our property will be adjoined by a hospital and by the new Sears and Roebuck shopping center. On the other side it is already built up with private homes, rather nice private homes. And I can understand their objection to business or commercial use next to them. But this land is much closer to the regional airport than our residence in Dallas, and if this city follows this device, for whatever means, of establishing single family residences around the regional airport, we are going to be in trouble. Now, I don't know that I—I don't know just how far the Federal Government should go in this, but certainly they should counsel with local governmental agencies and local government departments, and some warning should be issued to a developer, just as in a flood plain, that if he develops this area for single family residences, the Government, the agencies, no one wants to hear any complaint from the residents who build there when they know that the airport is already there.

So these are things approached from two different ends, and I hope that perhaps they have been of some use to you.

I am vice president of the Women's Chamber of Commerce and director of its legislative department, and I have a highly developed social consciousness although I come speaking as an individual this morning.

Dr. **Meyer**. Well, thank you very much. Your points and your information tie right in with the whole concept of the need for the consideration of noise as an element of planes. Panel?

Mr. **Berland**. I have a question. Mrs. Richardson, the city of Dallas now owns Love Field; is that right?

Mrs. **Richardson**. That's right.

Mr. **Berland**. I wonder if you brought any of these noise problems before the city council.

Mrs. **Richardson**. No, I have never complained before to anyone, and that's the big reason I'm so glad to have it here. As some of you may or may not know, there were extensive suits filed here in connection with the noise problem from Love Field. I can't tell you exactly the outcome of those suits. I think some were won, some were lost and some were dropped. I'm not the sort of person to go to court. The attitude of our city—getting to your question—the attitude of our city has been that of a highly indulgent parent for Love Field for many, many years. As you probably know, our city was very reluctant to cooperate in the regional airport. They would not cooperate in Amon Carter Airport. It seemed that Love Field was a matter of fighting pride with our city fathers. And I don't mean to be critical of them, but they seemed unduly bent on maintaining Love Field. And I have had the feeling that I might just as well go to an indulgent parent and complain about their one and only child as to go and complain about Love Field.

Dr. **Meyer**. That's been a problem elsewhere, people feeling somewhat frustrated with the system. And this is one of the things that our Agency is trying to work with, in conjunction with the Department of Transportation and with States and cities, in order to get a better approach to the problem. As a matter of fact, we usually try, when we hear a statement, such as the one we just heard, about the routing, we try to contact the appropriate elements of the Federal Aviation Administration. I shall do that in this case and get some information, and I'll also ask them to communicate with you on this.

Mrs. **Richardson**. Thank you very much.

Dr. **Meyer**. Any other questions, panel? Well, thank you very much, Mrs. Richardson. At this point, I will recess this hearing until 1 o'clock, at which point we will reconvene and continue hearing from the witnesses scheduled for the afternoon. Thank all of you for your attention and for being here.

(At this point the hearing was recessed for lunch.)

AFTERNOON SESSION

Dr. **MEYER**. Ladies and gentlemen, I'd like to call the second session of this public hearing on noise to order. One of our panelists is delayed, but we have a quorum, and so as with other hearings of this sort, we shall proceed.

Now, I'd like to ask Dr. Robert Finch of the University of Houston, if he's here, to come forward. Dr. Finch, we're happy to have you here this afternon and look forward to hearing from you, sir.

STATEMENT OF DR. ROBERT FINCH, UNIVERSITY OF HOUSTON

Dr. **FINCH**. Thank you very much, Mr. Chairman. I hope you have copies of the remarks that I prepared.

I had a little bit of a hard time deciding what one should say today, and since most of the technical papers of evidence is being given tomorrow, I thought that I'd like to say something that I believe impinges on the community rather more than the technical things. And I thought I'd like to talk about the role of the university in combating noise.

I guess I was very slightly preempted in this idea this morning, and I hope that I don't put the cat among the pigeons too much, so to speak.

Dr. **MEYER**. Well, we may unleash the kittens among the birds as we did before.

Dr. **FINCH**. I think in simple terms one might say that the role or the function of the university is to generate knowledge. And this function has two aspects: One is the transmission of old knowledge to new heads. This, of course, is the traditional teaching aspect of the university. And second—and I think equally important—the generation of new knowledge through research.

I'd like to discuss how the universities are contributing to the fight against noise, both in terms of teaching and research. I'd like to mention some areas in which I feel that industry and even the general public do not perhaps understand this contribution properly. And conversely, I hope to learn in what ways a university program, such as we have at the University of Houston, might be improved.

The formal academic subject area in which noise problems are tackled is called acoustics. And it's an unusual field because it really involves many disciplines: Physics, mechanical and electrical engineering, psychology, medicine, architecture, and others. There are some 90 schools in this country and Canada which offer some courses in acoustics, usually at graduate level. For those who are interested there is a listing of these schools in a recent edition of the Journal of the Acoustical Society of America.

However, there are not many schools which offer an integrated interdisciplinary program in the subject. We've been attempting to develop such a program at the University of Houston. At present our program involves a core curriculum of engineering courses in vibrations, transducers, which is a technical name for sound generators, sound radiation—which is often a complex subject because sound travels in the form of a wave, and sound propagation in solids. This core curriculum that we have is supplemented by specialized courses in noise control, underwater acoustics, and so on. Students may take courses in architecture, speech and hearing, psychology, music, and geology, which supplement the core course offerings.

Now, I mention these details because it comes as a surprise to many people to know that such specialized training is available and that there are graduates from such programs seeking employment. I am a member of the Education in Acoustics Committee of the Acoustical Society of America and one of the projects we've undertaken recently is to produce a twice yearly listing of acoustics graduates. This list is available free of charge to any company requiring to hire an acoustician. I have some copies of the list with me for anyone who might be interested in it.

I think that it's appropriate for me to add to what I have prepared previously, that the Education in Acoustics Committee is always seeking ways in which we can improve education in acoustics.

And I think it would be very appropriate, sir, for your office to have representation with us at some time.

Dr. **MEYER**. When we get around to the questions and such, I'll have to explore that.

Dr. **FINCH**. I might add that the chairman of this Education in Acoustics Committee is also a Texan, Dr. David Blackstock from the University of Texas.

I should add, for the benefit of the members of the panel, that I am also a Texan. I come here from Houston. And if you have trouble understanding my accent as compared with that of Dallas, I'm sure that that's the reason.

I might add that the recent job squeeze for university graduates that one has heard about so much in the press has not been so severe in acoustics. In fact, I believe there is a manpower shortage in this area. Dr. Johnson of the Pennsylvania State University recently conducted a manpower needs survey for acoustics which showed the need for about 350 B.S. level graduates, 250 M.S. graduates and 250 Ph. D.'s in 1972. A manpower availability survey by Solomon and Lasky shows that the outputs in 1971 will be approximately 200, 170, and 120 in the same three categories. So you see that we are producing substantially less graduates in acoustics, with an acoustics background, than our economy requires.

I've been perturbed by the attitude to the noise problem of some—I say some, not all—but some companies. These companies have been recruiting young engineers with absolutely zero training in acoustics and giving them responsibility for solving what are sometimes quite horrendous problems without adequate financial support or internal backing in the company. Another remedy is to assign the problem to a maintenance or safety engineer who is already so hard worked that he has no time to handle the problem, let alone get the required training.

I suppose this attitude stems from twin beliefs that the furor over noise will blow over and that magical remedies exist to quite noise. I cannot tell if the public interest in environmental issues will fade or not, but it is clear to me that every growth in transportation speed and volume and every extra industrial energy conversion device produces more noise as a waste product.

I want, again, to add something to the statement that I prepared. I want to say that on the other hand, I don't believe that saddling the engineering profession as a whole for the responsibility for the noise problem that we have is entirely justified. I'd like to point out to the members of the panel here today and the people who have testified before this panel, there are a very substantial number of engineers among them. And I wouldn't be in the least surprised that if you took a poll of the audience you will find a disproportionately large number of engineers present here. And I'm not sure how many social scientists we would find or how many politicians, but I don't think a proportional representation. I think that the blame for the problem should be placed where it really belongs.

At any rate, I return to the question of the handling of noise problems. I don't believe they can be solved either by magic or by unqualified personnel. The solution to noise problems requires careful and systematic study.

I think the fact of the matter is, a child could use a sound level meter or octave band analyzer if he could afford them. The problem with noise is not so much its measurement as what to do about it. Now, please do not misunderstand me. I'm not saying that the first step is not careful measurement—far from it. I am, however, insisting that noise control requires systematic engineering work by qualified personnel. And there are no short cuts.

I am talking here primarily about noise from machinery, maybe industrial, maybe household, maybe transportation.

I've wandered somewhat from my original theme of the role of the university, and now I wish to say a little about research. Again, I use the University of Houston as an example. Not to say that there are not several other excellent schools in acoustics, but obviously because I'm more familiar with our program.

Our noise research centers around our anechoic chamber, a view of which is shown in the slide on the viewgraph, if we can arrange that.

Dr. MEYER, Can we get that slide, please?

(At this point the testimony was supplemented by slides.)

Dr. FINCH. For the benefit of laypeople in the audience, I do have a picture here which I'm afraid is totally invisible from the back of the room. But an anechoic room is essentially a concrete box which is poured at the time that the building is poured. The one we have is supported on air springs around its perimeter.

The whole room weighs about 325 tons, but you can elevate it from the ground to isolate it from ground vibration. And inside it is lined with fiber glass wedges which absorb sound. We can use that room for all sort of sound control studies, and we made every effort to get our students interested in acoustics at that time.

Now, on the next slide here——

Can the lights be dimmed?

Well, this shows a console of electronic equipment which we use both for research purposes and to some extent for training students. It includes what's known as a real time analyzer which enables one to analyze transient sounds, such as, for instance, an aircraft overhead, or some sort of impact noise.

Now, our next picture shows one of our students measuring sound levels from a train in a switching yard. We've made quite a lot of studies of urban noise in the Houston area, all forms of transportation, including some unusual ones such as noise from speedways and from speedboats on the gulf.

I thought you might be interested, in view of the remarks on the airport, Love Field, to know about what we found at the Houston Continental Airport. This is a map which is called a noise exposure forecast which was produced by a very well-known firm of acoustical consultants, which I shall not name. I wouldn't want to cause any embarrassment of anybody on the panel. This noise exposure forecast was actually produced several years ago before the Continental Airport in Houston was put into operation. We thought it would be rather fun to go up there and see just how good a job this well-known firm of acoustical consultants had done, particularly in the way things would be. And I have to report to you that they had done an excellent job. As far as we could tell, this is just about the way it is, except for one thing. Let me point out some of the things on the map for the benefit of the laypeople here. The noise exposure forecast predicts that there will be one zone close to the flight path where many complaints will be heard from people living there. And on the others, somewhat further out, from which there will be complaints, but not so many. In fact, in the first zone, it's recommended that you really shouldn't live there. Now, the situation with the Houston Continental Airport is, it's way out of town. There are some subdivisions in the neighborhood, but in general, they are not in the line of the flight path. I hate to mention this, but a second or a third runway is about to be put into operation at Houston, this one here (indicating). This is not yet in operation. There is a subdivision right in the flight path. Those people are going to experience an unpleasant time.

This is another one of the research projects that we have been involved in. This is actually a project that Dr. Hooks, my colleague at the university, undertook. It's a map of the sound levels around two busy thoroughfares in Houston. If anybody knows Houston, then let me tell you that this is the Shamrock Hilton Hotel here (indicating) and this street here is Mason.

Now, the way in which this map was produced was to make measurements of sound levels at various street locations and then to go into a computer program which computes the proposed sound levels at other locations, and finally gives you a printout which is a contour of this map. They make them at different times of the day and they produce a moving film, which shows the way in which these contours shift around. Something like this, I think, could have some application, particularly perhaps in the more industrial noises, although gradually we are getting to use it more for urban noise. They have also made maps of this sort around speedways in Houston. They found some very interesting shifts in the patterns from time to time that they haven't yet been able to explain. We think they are probably due to winds at a rather higher altitude.

But I guess that's it for the time being. That's all the slides I have.

There are one or two points I'd like to make. We try to work closely with people in our business, as I have mentioned. Dr. Falck of our speech and hearing department we work particularly closely with. He has facilities for audiological measurements, and those have been extremely helpful.

How can university research programs of this type help in combating noise? At the University of Houston we are trying to concentrate our efforts to problems unique to our geographical area. Texas, of course, is a center for the petrochemical industry, and there are some problems that occur here that are rather special to that industry. We are particularly interested in control valve and compressor noise and the transmission of noise along pipe lines and its radiation into the plant and surrounding community. There are some problems here for which there are no really satisfactory solutions at present. We recently started research projects involving two radically new—at least I think they are fairly new. In view of the experts present I'll modify the record a little bit. I'll say I think they're new—concepts in muffler design. We are also working on methods of evaluating the performance of damping materials.

I hope that these remarks that I've made here perhaps helped to explain what we're trying to do in the university. And I've certainly heard some interesting comments today I think will help us to improve what we are doing.

But once again, I'd like to take issue with the remarks about engineering. The fact of the matter is that our engineering enrollment at the present time is plummetting. And if the unfortunate attacks that are being made on engineering are not moderated with better understanding of what we're trying to do, then I predict that in two or three years time the output of engineers from engineering schools is going to be one third of what it is at the present time. I think we face a very serious problem. And we do need understanding as to what it is we can do, and the backing to do the things that we can do.

Thank you.

Dr. **Meyer**. Dr. Finch, thank you very much, sir. I think I would echo one thing that you have said here about the environment that is not just limited to noise. Clearly we're dealing with problems and issues that are multidisciplinary in nature. You indicated at the outset of your presentation that acoustics was somewhat of a unique science because it involves a whole variety of disciplines. Well, the whole environmental issue is the same thing, requiring physical sciences, life sciences, social sciences. And I share your concern about some of the public attitudes towards engineers, but also I feel that some of those same criticisms apply to almost any of the professions that haven't taken the time or energy to learn the facts about man and his relationship to environmental stress.

Before I follow that up with some other comments, I will also say that engineers are sometimes accused of being politicians, and I guess I've had that same tar flung at me a time or two.

But I would like to ask the panel if they have comments or questions.

Professor **Cole**. Professor Finch, you mentioned in your program of acoustics economics, and I wonder—it seems like to me that noise, like so many other things, the solutions get down to a hard core nitty gritty problem of cost and cost trade-offs. And it seems that in training, this allocation of economic resources would be important in such a field. Do you have a comment on that?

Dr. **Finch**. Well, I didn't admit it intentionally. We have had some interaction with people in the law school who are interested in the legal aspects of drafting legislation. But it's true, we have not had a particular interaction with the economy.

Dr. **Glorig**. Well, I think that what Dr. Finch said, that acoustics is a multidisciplinary discipline, is very much true of any discipline. And I think what it really points out is that any of these ecological problems have to be attacked by a team, not by any one of these.

Mr. **Berland**. This morning we had some discussion about social conscience in academics, and the matter of wisdom as well as education. And I was just wondering if that's part of your program at Houston.

Dr. **Finch**. Courses in wisdom?

Mr. **Berland**. Yeah, courses in wisdom, or something one could take.

Dr. **Finch**. Well, I guess that we don't have something like that, and I don't know how we could do it. If you could tell me how we could do it, then we would be willing to try it.

Mr. **Berland**. Well, we're speaking in terms of social conscience; in other words, whether we're teaching people to use noise meters, or whether we're also trying to educate people to do something about noise, not only through contracting jobs, but through a social conscience. In other words, an application of the articles of science for the good of society as well. Now, that sounds rather lofty in words—

Dr. **Finch**. Well, I guess I'm half disagreeing with you, because what I was trying to find out was that, I think—my guess is, there are a lot of engineers here. If the audience will bear with us, we could ask just how many engineers there are here. Now, I believe that that will indicate whether or not engineers are interested in this program. And I will venture a guess that you'll find that probably a third of the audience is engineers. So I'm disagreeing with you.

Dr. **Meyer**. Well, I think that's logical. One of the panelists has said, "Let's check that guess". And, of course, you know this must be gaged like any other question; you really don't know the validity of it. You just see how many people hold their hands down and how many people stick their hands up. But in any event, just for the heck of it, let's see. How many people here are engineers or physical scientists?

Mr. **Berland**. That's pretty good. May I ask another question?

Dr. **Meyers**. Sure.

Mr. **Berland**. How many are here on their own.

Dr. **Ward**. Here on what?

Mr. **Berland**. Here on their own, not as part of their job.

Dr. **Meyer**. Engineers?

Mr. **Berland**. Engineers. Those who raised your hand who are engineers, how many of you are here on your own volition?

Dr. **Meyer**. I have a question which is more or less a question that really cannot be answered. But it was handed to me from the floor and I'll certainly introduce it into the record, and it's one for all of us to think about.

The question is: "Could the reduction of enrollments in engineering be due to the lack of responsiveness of educational programs to social needs, and thus do not appeal to social minded young people?"

Well, in the absence of an in depth survey, I don't know how we would be able to answer that. I think that may be part of the problem. It's certainly one that causes a lot of people at the various levels of the Federal Government, State governments and universities, and other elements of the Nation concerned with education, a lot of concern. Of course, this discussion could take up the whole afternoon, obviously, and we do have a fairly extensive schedule. I will say this: the area of concern that's been expressed by some members of the panel and by the witness is one which certainly is going to be a matter of concern to the Environmental Protection Agency. We are deeply concerned at the agency with the need for stimulating some new ways of looking at the whole question of education as it relates to environmental issues, not just to noise. To that extent, sir, with regard to the Education in Acoustics Committee: yes, I'd like to follow up with the acoustical societies for further action on this. And we'll appreciate your so communicating back to the committee.

Also for the record, I wonder if you could have copies of your printouts of your slides in black and white for us at a later date?

If not, it will be all right. But I would like to have them included in the record if at all possible.

Any other questions, panel?

Thank you very much, sir.

Now, the next statement we will hear is from Mr. J. W. Joiner—and I hope I'm pronouncing this right, and it's not the French pronunciation—of Joiner, Pelton and Rose, Incorporated. Mr. Joiner.

STATEMENT OF J. W. JOINER, JOINER, PELTON AND ROSE, INC.

Mr. **JOINER**. Thank you, Mr. Chairman. You had it correct. Distinguished panel, the remarks that I have here this evening will not contain any revolutionary or new insights in the development of noise pollution and its control. However, we are hopeful that the relating of some experiences that our company has had concerning governmental jurisdictions may prove helpful to you in your deliberations and your report.

Now, it is not intended at all, that these observations be taken as indicative of all jurisdictions and judicial levels in all the areas of our country. Neither should they be considered as compositions or taken out of context. We all know the dangers that exist when there is extremism, irregardless of its direction or purpose or its intent.

For some 17 years my company has concerned itself with noise abatement, analysis, and control. During this period most of our activity has been in the north Texas area and in the field of noise control in multifamily dwellings, noise control in commercial buildings, industrial noise control and aircraft flyover noise.

Part of this period we were involved in the manufacturing, sale and application of hardware items and materials used in noise control. More recently, we have concerned ourselves strictly with the engineering and consulting aspect with no proprietary interest in any hardware or materials whatever.

Therefore, not only have we been exposed to the measurement and analysis of noise, but the design, manufacture, sale, and installation of devices and materials as well. Most certainly this does not serve to make us an authority in the field, but it has proven helpful in enabling us to evaluate and appreciate responses we have received from a very wide range of clients concerning noise.

We read with interest the ASA newsletter we received last week in which ASA President Johnson referred to "would-be-philosophers" saying that the national priority in the 1970's will be our environment. I'm not a philosopher, but it is our judgment that concern for our environment will have more impact on our society in 1970 than anything that we have experienced to date. If this fact is not recognized by our Government, and proper consideration given this important parameter in our planning, there will be a hodgepodge of rules, regulations, laws that will make the depression period of alphabet agencies look like child's play. Everyone will find himself facing an impossible task in trying to determine just what agency, what law, or what guidelines apply to his particular problem.

We are already well on the way to just this sort of dilemma, and it is being complicated by those who advocate approaches and means that completely disregard economic realities on one hand, while on the other, we have the industrialist whose concept of free enterprise is to first make a profit and that anything that interferes with his operation is infringing on his rights as a citizen of a free country.

Again, we must be careful in not permitting ourselves to be caught up in this whirlwind of charges, counter charges and allegations.

It is time we recognized some very basic problems and meet them head on. We must be mindful that there is no panacea and that solutions must be carefully considered.

While we mentioned earlier the two extremists we have yet another group that is even more difficult with which to deal. That group is composed of complacent and apathetical do-nothing individuals. This may include a building manager, a plant manager, building contractor, architect, building inspector, a city official, airport manager, regional planner, State representative, State executive or indeed a Federal agency. We have met with them all, and many times with the same disappointing results.

Now let's just look at a few of these.

A few weeks ago we were called in by a manufacturer and his architect who were planning the construction of an industrial plant around which would be constructed some small homes for the employees. The guidelines were Walsh-Healey for the plant employees with no concern for the comfort of the families who would be living nearby. If they wanted a job they would tolerate the noise produced by the 24-hour operation of the plant. The architect and his client wanted just enough noise abatement so they would not be in violation of Walsh-Healey inside the plant. And we were informed that if there were any local restrictions concerning community noise, they would just move to another country or another region or another State to construct their plant, or where such nonsense as this did not exist. To many this type of thing is reminiscent of the early century textile mills and the nearby substandard housings.

Recently we did a study for a city concerning aircraft generated noise that will come from the new Dallas-Fort Worth Regional Airport. We prepared a zoning ordinance and building code along with noise contours, et cetera. And when presenting this material and recommendations to that city council in open meeting, the only real opposition was from a nearby developer, who incidentally controlled a considerable amount of land, but whose property was not even in the city limits. It was actually located in a higher noise zone than any part of the city under consideration. His unabashed statements were that the publicity of expected noise that would come from the airport when it opened in 1973 would decrease the value of his undeveloped land that is being planned for residential purposes. He further stated that such publicity concerning noise would make it difficult for purchasers of homes in his community development to secure good financial terms from mortgage loan companies.

Now, while speaking of the new airport, we are acoustical consultants to the architects for the terminal buildings, also for the utility plant, the administration building and the communication building. These are all separate architects, separate construction. In each case the architect engaged our services to assist him in dealing with aircraft noise as well as acoustical treatment, mechanical equipment noise and occupancy generated noise. When we learned that the governing authority of this 18,000-acre, one-half of a billion dollar complex being designed for the 2000 A.D. was considering a building and fire code for all future construction within that boundary, including proposed hospitals, hotels, offices, shops, stores, and everything that it takes to make a city, we contacted their chief planner to recommend that noise control be a part of the document. We were bluntly informed that noise and airports are synonymous and that people expected noise in that environment. The greatest airport in the world with no consideration given its worse byproduct, noise.

Now, let's look a little further up the government ladder. Dallas, our beloved city, has one of the finest city noise zoning ordinances in the country today. It is clear, thorough, and very reasonable in its limits and language. The ordinance has been on the books for several years. And for some years after its enactment inquirers were told that the city did not have a budget for equipment and personnel for its enforcement. About 3 years ago, an octave band analyzer was purchased and an employee of the city health department was instructed in its use. This employee has since resigned from the city because all of his activity was used in other environmental parameters rather than this and it had a very limited budget and other problems. We contacted the health department and offered free our services to the city to train two or three of their employees in the use of sound level instruments and interpretation of their readings for comparison with the ordinance. Our offer was declined with thanks. We next contacted the assistant city manager with the same offer. This was likewise turned down with the remark similar to, "We are afraid we might be opening a can of worms." He was then receiving two or three complaints a week from citizens concerning possible violations of the noise ordinance and that he was informing, so he says, the callers of the complexity of noise measurement and enforcement of the provisions of the ordinance. He said for the time being he wanted to let well enough alone. Those were his remarks to me. We then recommended to him, in writing, that the city give consideration to the formation of a board, a committee or commission consisting of three or four knowledgeable and interested people that would be available to advise our city council, management, industry, developers, planning boards, unions, governmental agencies and insurance carriers on the state of the art on noise pollution analysis and control. This would be a nonbudget item. Some 2 months later this suggestion was turned down as not being practical. Dallas, the 1971 all-American city, the home of the famous Glorig-Callier Hearing Center, a city of a million people, a scientific, educational, computer, and technical instrument manufacturing center, a fine noise ordinance on the books, a budget of $190 million a year—$189.9 million, to be exact—with 12,000 employees, and not one of them can make a noise survey.

And now let's look at another area. Apathy does not stop at the city level. We have a North Central Texas Council of Governments for an 11 county area and cities in that area. Now, I think this is composed of 132 governmental agencies. This is a great planning group and they function with committees. One such committee is now working on a building and zoning code for communities and cities to be affected by the operation of the new Dallas-Fort Worth Regional Airport. Yesterday afternoon they had their third and final public hearing and reading of the proposed document. Noise is not a part of that code. It is left to the individual communities if they wish to pursue it. Can you imagine one community saying, "We do. We want control." The adjacent community then will not be able to get the industries. In all fairness we must state that the regional council planning staff is very responsive to noise studies and its control.

Now, the State level can be even more difficult when it comes to good and meaningful legislation. During the legislative term just ended, we understand that over 100 bills and resolutions were introduced concerning our environment. We further understand that few, if any, ever got out of committee, and none were passed. We have had several conferences with Representatives and Senators in addition to the Governor and his planning staff, recommending a committee or board to screen and evaluate noise pollution problems with a view toward meaningful legislation in this area. Some representatives and Senators seemed to favor such an approach. The Governor and his planning staff also seemed to be making some progress when all at once insurance, fraud, banks, stocks, SEC, and maybe just a little bit of politics mixed in, completely took over and usurped all constructive planning.

Inaction and indecision are not limited to the industrialist, the developer, the airport planner, the city, the regional area or the State, but extends into our Federal agencies and departments as well. The principle agencies with whom we have worked are GSA, Corps of Engineers, FAA, FHA, and Labor Department. And of course, there are many others who are concerned with noise pollution and its control. The big problem that always seems to be present is criteria, jurisdictional control and technical knowledge in noise. The end result here is, we are often receiving the same responses and cooperation—a better word would be noncooperation—as we have set out in the cases above.

Mr. Chairman, these remarks may appear to be negative and critical of our clientele, but this is not our purpose at all. We enjoy dealing with our clients, we like our industry, we think that we have competent personnel to perform a worthwhile service to our clients and we have made every effort not to polarize our thinking in environmental matters. We discuss this almost daily in our company.

Our purpose and desire is to upgrade the industry, and we have attempted to demonstrate that this is almost impossible when left to the many jurisdictions that are now involved, regardless of how competent and interested they may be. Of course, we strongly support the early enactment and implementation of the Noise Control Act of 1971 as set out in H.R. 5388.

Thank you, Mr. Chairman.

Dr. **MEYER**. Mr. Joiner, thank you. Since you are in the delicate position of an executive consultant, we appreciate your being so candid about your views of some of the people you have as your customers. Panel?

Dr. **GLORIG**. John, you and I have known each other a long time. Some of these things you say are very true, and I back you up 100 percent. But there are some things going on that you might not have painted quite so blackly. The North Texas Planning Council has a committee on noise in the environment, and I happen to be a member of it. It is active and things are beginning to come out of it, slow, I agree. But I have been chairman of the committee of the American National Standards Institute for 12 years, and we have finally gotten a brief document after 12 years with respect to industrial noise. I was chairman of an international committee for the same number of years and now we have a published standard for that. So, I think the thing that you're not taking into account, and probably rightly so because of your enthusiasm, is that there are many slips between the cup and the lip, and it takes a long time to get the cup to the lip in some of these things, and I have a tendency to agree with you on it. This is no excuse. I am merely saying that with all the interests that are involved, with all the judgments that have to be traded off, cross-trades with dollars for decibels and decibels for dollars and all the rest, it takes a lot of looking at in order to come up with something specific like a standard.

Mr. **JOINER**. Dr. Glorig, you are correct, absolutely. And I believe of all of the six or seven jurisdictions I was talking about, I think that perhaps COG was the only one that I did mention here that was interested. In fact, they commissioned us in preparation of this building code, zoning code, concerning aircraft noise, as we did for the city of Irving. It is also a model code that is available to the other cities in the area, which hopefully they will adopt it as the time comes on. But we felt that the provisions of this should have been in the zoning code that is now up for approval concerning that area. But I quite agree with you on this.

Dr. **MEYER**. Well, I'm not familiar with the local problems, so I can't really comment on any specific point. I would have to say that I, and most of the people that I know who are looking at the problems of the environment with any degree of interest, feel that it is a major problem and it isn't a flash in the pan. Mr. Ruckelshaus, our Administrator, gave a talk not long ago, and I will quote from it here. He echoed that view, and also pointed out something else which Aram Glorig pointed out. And I'd like to just quote it for the panel and for the audience.

> Our hopes for this agency are high. We know all environmental problems will not be solved this year and next. But if we remain flexible in approach and firm in our commitments, we believe that we will be able to live up to the challenge that the 1970's must be when America pays its debt to the past by reclaiming the purity of the air, water and living environment.

I feel that there is a debt to repay here with regard to all elements of the environment, including the noise part. As we go through these crisis situations, such as we are faced with nationally from time to time, this is still an underlying problem. At the same time, a matter of real concern to us, they are doing the planning for Federal legislation in support of the States and the agencies on how to deal with this multiplicity of jurisdictions, as you have mentioned, and still not get the Federal Government right down to determine what the noise level at the corner of Mockingbird Lane and some cross street in Dallas, Tex. We feel that somehow or other, maybe through these councils, the North Central Texas Council and so on, these problems ought to be approached on a local level with some very meaningful guidelines.

I appreciate very much the approach that you've taken here.

Mr. **JOINER**. I'd like to respond to just one—or clarify something, perhaps. I was a bit critical here of our city, and this was our past experience with our city. I would like to state in all fairness to Mayor Wise that some week or 10 days ago I was in discussion with him and I told him of my anticipated remarks concerning Dallas, and that I appreciate very much the attitude that he has taken in the 2 or 3 months since he has taken office. I do hold a lot of hope for more concern on that level for our city environment.

Dr. **MEYER**. Before I pass it to my colleagues on the extreme right, I will say that your remarks about the problems in the Federal Government are also valid. We are trying to work out a better mechanism of coordination of effort through our agency, particularly on noise.

Mr. **JOINER**. Yeah; we have too many bosses. I mean, we don't know who to look to.

Dr. **MEYER**. That's the chore that we're trying to come to grips with right now.

Professor **COLE**. Mr. Joiner, I was just wondering, are you in a position to elaborate on the response by the city to your suggestion for a commission or a committee as being impractical?

Mr. **JOINER**. I have a letter here, and they said that they thought that it would have—that there would be a flurry of interest, and then it would die down. They thought that it needed to be expanded into—this is the assistant city attorney—city manager—and that it would be impractical to consider at this time. He said in summary, "We find ourselves lacking in legislative authority and lacking in trained staff and lacking in clear definition of the noise problem." Well, I think that's really what we're trying to address ourselves to here. "And at some future time—at some time in the future the advisory board might be helpful in the educational process as well as identification and hiring trained technicians and so forth."

Professor COLE. Do you intend to raise that issue again?

Mr. JOINER. No. We are strictly—while I have taken a rather strong position here, or seemingly so, we are not politicians or crusaders in any sense of the word. I was relating some problems that I had conducting my business with various levels of government, strictly, and I have no intentions of pursuing it any further, although I did give Mayor Wise a copy of the communications I had pertaining to this.

Dr. MEYER. Thank you very much, sir. We appreciate your candor and also that of the panelists.

The next person to talk to us is Mr. J. A. Shirley. Mr. Shirley, are you here, sir? Is Mr. Shirley among those present at this time? If not, I'll hold the space open, and if he comes in we'll invite him to come and talk to us.

Mr. Rod Rylander of the Texoma Outdoor Club. Mr. Rylander.

STATEMENT OF ROD RYLANDER OF THE TEXOMA OUTDOOR CLUB

Mr. RYLANDER. Thank you, Dr. Meyer, panel. I come as a representative from the club, and also as a citizen of our great country. I want to say that I believe that it is the inevitable right of the individual to be provided an environment on his private lands and on public property that is inducive to his good health, welfare, and pursuit of happiness. This right should include clean air to breathe and a noise level that enables him to protect his precious sense of hearing, to enjoy in particular areas the right to the absence of manmade noise, and the right to carry on everyday business without interference of excessive noise.

For instance, I have an office on the highway, and my air conditioner went out. Upon opening the door for fresh air, I was unable to carry on a conversation or hear on the telephone due to the tremendous noise created by the trucks passing out in front.

Second, I bought 350 acres of trees and hills to retreat to when the noise and confusion of our civilized world becomes too annoying. The peace and quiet of this preserve is broken by low-flying aircraft or the loud cracks from the guns of hunters. I believe that I should have the air rights high enough over my land to prohibit the origination of noise that is audible at the surface. Now, I'm not talking about the long-distance airplanes that are so high that I can't bear them. But I think I should have the air rights up to the level where on the surface it makes noises. I believe that the guns and other surface noises should be silenced to the point that the noise does not penetrate into the adjoining private or public lands. Now, this is not just my own, but in other words, State lands and places that are retreats. I believe that this is especially important within our national parks, recreational areas and wilderness and wild areas where citizens go for the purpose to seek the peace and quiet found only in a natural environment. To help to control noise in a park, I suggest that we encourage the development of peripheral private lands instead of park lands and eventually eliminating all private vehicles from the parks by installing mass electric railways. Also the minimum height of aircraft should be raised to the distance where the noise is inaudible on the surface.

In order to insure that noise laws and regulations are carried out, if and when they do pass, we should legally permit individuals and groups to bring injunction against responsible parties destroying the basic right of the individual to enjoy freedom of noise pollution on public terrain and on his own property. The Government should create guidelines in the definition of noise pollution in different situations.

To sum up, I want to stress that I believe that it is the individual right of the citizen of the United States of America to live in an environment free of air and noise pollution in his pursuit of good physical and mental health and happiness.

A simple law—if I go out and slug somebody, he has a right to bring an injunction against me even if the State does not. OK; now, if I go out to a home and smash a window, action can be taken. If I go out and put a huge loud noisemaker and the State doesn't take action, I think the individual should be able to take action.

Thank you.

Dr. MEYER. Thank you very much, sir, and I appreciate the way that you have concluded your remarks about comparison of invasion of your privacy and your personal rights with these comparisons.

Panel? Thank you very much, sir.

The next person who we have scheduled to discuss with us views on noise is Mrs. Sharron Stewart of the Citizen's Survival Committee of Lake Jackson, Tex. Mrs. Stewart.

STATEMENT OF MRS. SHARRON STEWART CITIZENS' SURVIVAL COMMITTEE

Mrs. STEWART. Panel members, thank you. You all have copies of this?

Dr. MEYER. Yes. Thank you, ma'am.

My name is Sharron Stewart. I live at 328 Redwood, Lake Jackson, Brazosport, Tex. I'm a housewife, mother of three, former school teacher and sometimes artist. Today, I am here representing the Citizens' Survival Committee whose corporate office is at 124 West Mulberry, Angleton, Tex. For the record, I have three statements from our members on industrial noise pollution. My statement is based on noise in the home and school.

On June 23d, 1971, the Houston Chronical printed a story by Bruce Ingersoll of the Chicago Sun-Times, entitled "Noise May Be Breaking Up Families". Dr. Westman, who will be here tomorrow, may recognize the title; it is an interview with him. As I first read the article, I felt a great deal of personal identification, and I am sure did most people who read it. I shall quote only the portion that concerns me most.

> "Tired mothers have all the symptoms of combat fatigue, he said. Having undergone a noise bombardment all day, running the vacuum cleaner, quelling quarrelsome kids, using the electric mixer, they are short-fused, depressed, done in. Their heads throb, their stomachs churn.
>
> Having an extremely active child around doesn't make a housewife's day any easier, said Westman, Director of the University of Wisconsin Medical School's Child Psychiatry Unit. Such a child, he said, is easily distracted, flounders in school and can be touched off by the slightest noise.
>
> Noise spurs the child into obnoxious behavicr, Westman explained. This provokes the mother. She cracks down. The end result, a vicious circle of mutual annoyance.

In school systems, the hardest position to fill and keep filled is that of the shop teacher, particularly the introductory classes on the seventh and eighth grade level. Noise, combined with large classes of 12- and 13-year-olds, usually all boys and often predominately "problem" students, create an untenable situation for both the teacher and child. As a teacher, it was difficult for me to understand why a boy who was well behaved during an art class, or a student who could get by during English, became a holy terror during shop class. It was equally difficult for them to understand why I was reasonable in one situation and not in another.

At the time I understood the effect of the noise and large classes on myself. Today, as the mother of an overactive child, I can better understand the effect the constant noise in those echo chambers called shops had on the students.

The "hyperactive" child at best has developed deep psychological problems by the age of 12 or 13 as a result of his "obnoxious behavior" in classroom situations, where it is not appropriate or tolerated.

In literature put out by the Association for Children With Learning Disabilities, it was stated that one in every three children in the United States have some form of learning disability and that of these three, one in every seven is hyperactive.

It is not difficult to imagine the positive effect a great reduction of the noise level could have on this large segment of students, not to mention the improved learning situation for all.

The sociological implications of the reduction of noise levels in the schools should be taken into account. We should not, we must not, neglect the effect of noise on our most important natural resource, our children.

When considering the added cost of building, or the reconditioning of old school buildings, it should be pointed out that reduction of noise usually also results in lower utility costs, and easier maintenance as byproducts.

It is up to the experts such as this distinguished panel to determine the proper noise level in the classroom. It is up to Congress to enact legislation on noise that adequately covers the school room. And up to the ingenuity of American industry to find and use the best noise reducing materials, and up to our local school board to implement this legislation.

I've included this clipping for the record. I'm sure you will have much more adequate material on this statement, but of all the things I have been able to find on noise pollution, this was the only thing I found that did mention this one specific problem, and it is growing, and it affects everybody.

Dr. MEYER. We'll include that with the statement.

Mrs. STEWART. The other three statements I have are short, and they are on industrial noise, and specifically on industrial noise in power plants. In our area, we have the largest industrial power plant in the world. Testimony before the Water Quality Board on February 25 by a member of the industry, a representative from our area stated that their power plant in operation at that time would provide enough power for a city of 5½ million people. They have now almost doubled this capacity with the additional plant that is completed.

Incidentally, there are 55,000 people living in our area, and they are not serviced by this power facility.

The first statement is by Mr. George W. Moore of the Citizens' Survival Committee.

This statement is my personal testimony representing my experiences, feeling, and objective looks at industrial noise pollution. If you can be objective after listening to it for many years.

My experience ranges, the past 20 years, from operating unmuffled farm machinery, pneumatic hard rock mine drills and detonating high explosives, to the present, which consists of working around huge howling gear reducing machinery, large air blowers and high pressure steam leaks.

I am an industrial maintenance electrician, 39 years of age and I reside at 622 Mulberry Lane, Brazoria, Tex. I am presently employed at Dow Chemical Co., Freeport, Tex.

First, noise and its physical effect. This is a direct effect which can lead to tone deafness and even ultimately to total deafness. All of this can be branched off, to play a direct part in industrial accidents, inability to hear warning sounds of danger.

Second, the mental and emotional effects of noise. While this problem is perhaps not as easily defined, and much harder to pinpoint, it may be the most devastating of all. A little baby jumps and cries from harsh noises. As we grow older we learn to hide and suppress this natural reaction, for whatever reason. However, it does not take a psychiatrist to tell you what this can ultimately lead to, particularly when forced to work with it for 40 or more hours a week.

This is but a small digest of my feelings on noise pollution. Thank you.

The next statement is by Mr. Leslie Cartwright, from the Citizens' Survival Committee.

I am an electrician, and as such have worked in some form of industrial plant for 15 years.

One thing that all industrial plants have in common, regardless of their product, is noise. Of all the noises that I have heard, two particular types have left a vast impression on me. One is high pitched steam noise and the other is a continuous smothering roar caused by heavy machinery turning at high speeds. I have worked with men who were slowly becoming deaf from the constant noise that they worked in every day. This is especially true around steam generated power houses where the noise levels are extremely high and constant 24 hours a day. I worked in such a power house for about 1½ years, during which time I saw and heard one of the first gas turbines put into operation for generating electric power. This machine turns at 3,600 r.p.m. and produces a high pitched whine that can be heard almost anywhere else in the plant over all the other industrial noise. They ran noise level checks in the area and issued orders for anyone working around this machinery to wear ear protection. The company furnishes heavy duty headset type ear muffs in that area. When I had to perform work in these areas, I noticed a high increase in my own irritability and would find myself gritting my teeth until my jaws ached. I also had to concentrate very hard to perform a simple job that would normally be almost automatic. I would often find myself working in what could be described as frantic haste to finish a job and get away from such a high concentration of noise. It seems that when the body is subjected to extreme noise that it tries to rebel, and only by force of will can people perform their work.

It is my conclusion that constant exposure to high frequency noise raises the accident rate, causes loss of hearing, contributes to nervous disorders such as ulcers and metal disturbance, hypertension and possibly high blood pressure.

The last one is by Mr. B. A. Kelly, executive board, Citizens' Survival Committee.

I wish to inform you of several experiences with noise pollution at the Dow Chemical Company, Texas division, Freeport, Tex.

During my employment at the Dow Chemical Company, I worked in several areas where noise pollution presented adverse physical and personal effects.

I was an electrician in power house No. 1, located at plant A for 1½ years. Power No. 1 has eight steam-driven generators, one gas turbine generator and 11 boilers. There are several serious noise problems in this power house:

The steam generators and 10 boiler fronts are located under one roof which combines their noise on workmen in the area.

A steam pressure reducing station is also located in the same building.

The decibel level around the gas turbine is extremely high and the force draft fan for this generator has a special noise barrier built around it, which provides little or no help. Electricians must oil the bearings on the motor for this fan while it is in operation.

Brushes on the excitors and collector rings must be changed on all generators while in operation. They are engergized at 250 volts and above, and rotating at 3,600 r.p.m. This in itself is very dangerous and is multiplied greatly by the effects of surrounding noise. The number of accident reports will verify this.

Dow provides ear plugs and ear muffs which offer minute protection for their employees.

In this same relatively small area, being about one-half the size of a city block, there are 20 induced draft fans, 20 other force draft fans, 16 large sea water cooling pumps, approximately 13 steam or electrical-driven boiler feed water pumps and nearly 200 other electrical-driven noise producing devices.

The greatest effect of this noise was on my family. During the workday, I would mentally try to block out the many noises in the plant. This affected me after work hours because my wife and children would have to repeat what they had said before I could understand what they were saying. I was hearing and yet not hearing at all. Within 3 months after being transferred from the powerhouse to the shop, I was able, once again, to hear and understand what someone was saying the first time.

Dow has three other powerhouses with similar problems, plus two gas turbine generators at the A-100 block, one gas turbine generator at chlorine

No. 6 with two more to be built in the near future and two gas turbine generators at the Oyster Creek Division. This added to the hundred or more electrical, steam, and combustible engine-driven compressors, the power-driven tools, and other process machinery add up to a lot of noise.

The amount of noise created by leaking high pressure air, steam, and process lines is beyond imagination. It would take a book to list the many noise problems at these plants, and yet one hearing them would be believing.

No amount of $1 earplugs or $10 earmuffs will solve these problems. Only basic and considerate plant engineering and equipment design will protect the workmen in these plants from the many noises that the executives, in their properly insulated, air-conditioned and far-removed front offices do not hear.

So far, I suppose these are the only statements from people actually working with the noise, and who are not complaining when their air conditioning breaks down. It points up another problem, and that is the problem of industrial shutdowns. They are almost nonexistent. If you design equipment to be effective at 100-percent efficiency, how can it be effective when it's still operating at 40-percent efficiency and you have between 1- to 200-percent capacity that they are overproducing for what the equipment was designed for, and this is the general rule in the State of Texas. I cannot say about other areas, but as far as ship channel industry and the Brazosport industrial area, these are the only two areas I have had experience in, I can say that it is generally true in that area.

I had not planned to mention my own personal peeve today.

Dr. **MEYER.** Please go ahead and do so.

Mrs. **STEWART.** Well, it goes back to the Environmental Protection Act giving the citizens the right to sue for injunctive relief and not damages. I don't feel that point was made adequately clear this morning. This injunction could be temporary, and after a period of three trials, become permanent. If, after all that long period of time—those of you who have had any dealings with legal processes know it's a long time to become permanent.

Now, this bill, which passed in Michigan and became law, had several months' lapsing period before it went into effect on November 1 of last year. Mr. Fritz mentioned that 12 suits had been filed. I believe——

Mr. Fritz, isn't it right that eight of those were filed by existing governmental agencies, or by citizens who were suing their own municipalities for improved sewage treatment, and no citizen sued industry?

Because a funny thing happened; industry started cleaning up. And in the county of Detroit, 26 percent in 9 months.

Can you imagine the effect of the reduction of the noise level in the United States of America, 26 percent in 9 months? That's something to think about. I think perhaps one of the reasons is that not only is industry subject to being closed down, which will be extremely expensive—if one piece of machinery is out of operation for an hour can cost them a million dollars loss—I'm sorry, half a million dollars loss—what would an injunction until they clean up cost them? Therefore, they clean up immediately.

We Americans are very, very competent people when we have to be. Look at the technicians in this room. The job can be done, but it is about time that industry and the rest of us be reminded that all of us too have rights, and the earth that we live on has rights, and that if we don't regard the earth's rights we won't be living here.

A lot of suggestions have been made about parks. It must be remembered that national parks do not protect the land. If you want to preserve an area in its natural state, you had better work to get your State and Federal Government to have it made a wilderness area and state its specific uses. One percent of Texas parklands, I believe, is a wilderness area, and that's all.

And these are the things that I noted from the meeting so far today. And that's the end of my statement.

Dr. MEYER. Mrs. Stewart, thank you very much. Before you leave, the panel may want to ask you a question or two. Mr. Berland?

Mr. BERLAND. I'm wondering, some of the things you read in terms of industrial noise, I wonder if this doesn't fall under the Walsh-Healey Act. I don't know whether Dow does any work for the Government or not.

Mrs. STEWART. They certainly do.

Mr. BERLAND. And if so, wasn't some relief sought through that medium?

Mrs. STEWART. Enforcement is a problem in our area. Some of this will also fall under the new Workmen's Safety Act which goes into effect the 27th of this month. We hope it is enforced a little better than the previous act. I don't know exactly how the Walsh-Healey Act works, who is responsible for enforcing it.

Dr. MEYER. Will the lady and my fellow panelist yield a moment?

Mrs. STEWART. Certainly.

Dr. MEYER. Let me clarify a couple of things if I might. I think they are important. This matter of industrial noise as it relates to total noise exposure is very important. I hope one of the other panelists—if not, I will—come back to this in a moment. Let me be sure that we understand a couple of things. One, the Walsh-Healey Public Contracts Act applies to all work done by industrial establishments dealing with the Federal Government involving over $2,500. But the Walsh-Healey Act was repealed by the Occupational Safety and Health Act of 1970, and the Walsh-Healey Act is no longer in existence. Everybody—I keep hearing it all over the country—keeps talking about the Walsh-Healey Act. There is no Walsh-Healey Act. It was repealed by the Occupational Safety and Health Act which carried forward all of the rules and regulations which had been issued by the Secretary of Labor, under that old act, relating to Federal contracts until such time as he could issue the new Occupational Safety and Health standards and regulations under the new act. The new regulations simply say that all the standards relating to hearing protection which were applied to Federal contracts now apply to any manufacturer or any industrial operation engaged in commerce. Commerce being loosely defined in the mind of the public as interstate commerce. So any industry which is engaged without any dollar limitation—maybe manufacturing one product in its plant and shiping it to another State—could conceivably be concerned with interstate commerce and covered by the Occupational Safety and Health Act. But in the field of noise control, one of the things that most people become completely confused on is that the employer has an option. The employer has the option of reducing the noise level in the plant so that it meets the environmental conditions specified in the regulations; that is, so that no employee is exposed continuously during an 8-hour day to the equivalent of 90 decibels measured on the "A" scale of a standard sound level meter, or proportionately higher levels for shorter periods of time. I won't go into detail on that. He can either do that, or he can provide hearing protection which is approved by the Secretary—in this case, the Secretary of Labor on the recommendation of the Secretary of Health, Education, and Welfare—which will reduce the acoustical energy reaching the ear canal to the levels provided for in the regulations. And there are indeed some ear muffs and some earplugs, or a combination of earplugs and muffs or helmets, which indeed can be procured, and which for most industrial situations will provide for the hearing protection. Now, the problem here is—and it's a major problem—it ties in with something that's already been said earlier today about responsibility for design and how we teach people about these things—include the understanding and requirement for engineering design right at the start—in educating people to do this. A lot of this equipment has been built, installed; it's there. And so, as you said, you can shut the plant down. The question comes up, what does the employee do? I'm not taking the side of those who say, "Well, close up." I'm just pointing out a fact of life. It would be very difficult for that manufacturer to make a product and make a profit while his plant is shutdown, and at the same time, it would be very difficult for his employee to be drawing a salary while he is completely rebuilding his plant. So in many instances, he has to use hearing protection until he can progressively replace this equipment. The problem you're raising is, how to get this done, and done adequately. This is one we have given a lot of attention to.

Mrs. **STEWART**. That and another one, that of maintenance. I think there should be enforced maintenance for all plants where they should all have to shut down periodically, and that it should be supervised so that these breakdowns that they let go and let go—"Well, when we shut down 6 months from now, we'll fix it." But the 6 months came and went, and they still haven't fixed it and they still have this high pressure steam leak that I can hear 5 miles away at my house at night when it's reasonably quiet, as well as feel the vibration from the plant any time of the day or night.

Dr. **GLORIG**. Dr. Meyer, you brought up a very important point here. The original Walsh-Healey Act specified 90 dB(A) and, at least as I read it, said that the noise reduction shall be used wherever feasible, and then the other shall be done. Is that different than the new Occupational Safety Act?

Dr. **MEYER**. No, it's not different. It said it shall be done where feasible. And as you know, what happens is, they say it isn't feasible.

Mrs. **STEWART**. Who determines what's feasible?

Mr. **BERLAND**. Mrs. Stewart, you know this is a hearing before a Federal Agency. And I am wondering what sort of relief you have sought from local agencies, if any.

Mrs. **STEWART**. Relief that we have sought? Well, the political structure of our local agencies is such as it is in most areas. We have been working on air and water pollution because the Brazos River is dead. It's the largest individual river water shed in America in one State, and it's dead. It's the third largest outflow into the Mississippi. And there are no bethic organisms in the bottom mud. The waste canals from Dow run at better than 5,000 cubic feet per second, I believe, and the river comes down to 4,000. So in other words, the waste is going into the river. Now, the river used to be much higher than that, but because of dams up stream it has slowed down. There are four more being planned right now, to slow it even further. As one Federal person, who came down and looked the situation over, said, "Your water pollution is abominable, but your air pollution is worse."

We are concentrated in one area with the largest industrial plant in the world controlled by one company. This is the largest individual plant, and they are producing 90 percent of the world's magnesium plus so many poly and vinyl-poly and chloride products, it would be impossible to even guess. And if all the figures were in front of me on one page on the amount of chemicals produced there daily—I do have them, because they are of public record, but I hadn't planned on speaking on this particular thing, so I didn't bring it. But it's so fantastic it's unbelievable. When you get into figures that high you just don't believe them. You can't comprehend it, but it's there.

It can be cleaned, because every new plant they build, and they keep expanding, is—they just finished one that's totally recirculating, recycling, and they even planned for breakdown preparations, labor safety, noise. They put everything into account with all the new Federal standards that have been enacted, and those they have a feeling will be in the next few years.

But there is relatively no maintenance. Their maintenance schedule is not adhered to the way it's supposed to, even by law, and it causes serious, serious problems. We have continual daily gas leaks. And so the ship channel area, either in the Bayport area—and these are the three main problem areas in the State of Texas. I'm sorry to say that the Dallas-Fort Worth, my old home area, has to rank about number five. You're just not that dirty yet.

Mr. **BERLAND**. Are you saying that the companies involved, with which you have had experience, do nothing in terms of cleaning up pollution—and I'm talking about noise also—unless forced to by law?

Mrs. **STEWART**. Absolutely. And they will be in compliance the minute the law is effective. They are leaders in all fields of pollution control procedures. In Michigan, they were clean when the law went into effect. The Philoboskie River into which their plant —which is smaller, but similar to the Texas division—was reclassified as a recreational stream, at their ecology council's request, the day the law went into effect. And they were given by State law 4 years to clean it up to where it would be classified as a recreational stream.

By the way, the Brazos River is classified by the State of Texas as a recreational stream for swimming, fishing, and contact sports. We recently measured the temperature at the "A" canal outfall at a 114° when two young men lost their boat motor there. And there was just no way of them diving for it. So I don't think you would want to participate in any contact sports in our area.

Dr. **MEYERS**. Mrs. Stewart, before you go, there is one thing I do want to point out; and I want to remind my colleagues, some of whom will be working with me on problems of psychology and physiological effects of noise, that one of the points you raised here, about the exteme industrial noise situation, we have to keep in mind that people exposed to noises such as you have described, and who then drive home in an automobile, and then are subjected perhaps to some of these other noises we've heard about, airplane noises, kitchen noises, and so on that may even be pretty low in intensity, may be a problem that we need to look at. I think it's well to have it interjected into this discussion on urban planning and the general noise problems. We are reminded that we have to look at a continuum of exposure to all sorts of various things.

Thank you very much for a very stimulating presentation.

Mrs. **STEWART**. Thank you.

Dr. **MEYER**. Our next speaker, as Mrs. Stewart has indicated, will probably have some words to say about natural environment. He is Mr. Thomas Maddox, who I understand is the chairman of the north Texas group of the Lone Star Chapter of the Sierra Club. Nice to have you here, sir.

STATEMENT OF TOM MADDOX, SIERRA CLUB

Mr. **MADDOX**. Thank you. Mr. Chairman and gentlemen of the panel. Before I read this statement, I'd just like to make two comments. First, this typed copy is very rough. I would appreciate it if you would correct spelling and make allowances.

And second, several people have mentioned 1970 as possibly being the D-day of the environment. I might make the prediction that if it isn't, 1980 is going to be one hell of a D-day for the environment.

And third, some of the things I have to say have already been covered, but nevertheless, I'll go ahead and read it.

Living, as I do, close to a sound generator that can produce extremely loud, unexpected noise at anytime of day or night, I have some first-hand, or first-ear, experience of the noise problem. I live opposite a fire station. This statement is a personal view rather than specific policy of the Sierra Club, but it could represent the view of club members in the north Texas group in a general way.

The fire siren is a necessity, of course, and because of the consideration of the firemen and the relatively infrequent occurrence it is only a minor annoyance. The sound of the railroad freight yard about a mile and a half away is not unpleasant, though people living close to it would disagree. The noise of the jet engines on their test beds several miles away—and I should add here that I live in Fort Worth, not Dallas as is on that list—it must be 6 miles away. It is both persuasive and irritating. But I consider myself fortunate to live in an area so free of obtrusive external noise. The school at which I teach is fortunate too; on only a handful of occasions in 6 years has aircraft noise stopped me talking. And I have students who stop me with very great frequency. It is intolerable to try to teach or learn in a school under airport flight paths or alongside busy railroads. And I have taught in a school in London by the side of a railroad station, and at times it was utterly impossible to do. May I suggest that to demonstrate the psychological effect of noise you take an elementary school class out of their classroom and into a noisy environment.

It is when I go on weekend outings or on vacation that noise really begins to disturb me. Last year at a national forest campground in southeastern Colorado, there was a seemingly endless procession of people of all ages driving trail and minibikes. Not only on trails, but around and around the circular path that ran through the campsite. It was here, incidentally, that I saw a bazaar example of multiple use. Trails were sign posted and reserved for walkers, horses and two-wheel vehicles. I never actually witnessed a confrontation between a horse and a trail bike, fortunately for the horse. Though I think to be fair I think the object was to exclude four-wheel-drive vehicles on the trail. And at campgrounds on the shores of lakes where water skiing is permitted—and we have a number of these in Texas—the noise of outboard motors is too evident. And it seems—I hope you don't mind my interjecting here—there are, let's say, outboard motors, trail bikes, snowmobiles in the so called multiple use areas, their dominant use seems to be the loudest, which is unfortunate. Now, I personally go to these areas for, as Mr. Rylander said, some discreet bird watching and just to enjoy myself in the quiet surroundings.

Relatively quiet motorcycles and outboard motors have been produced commercially, and there is little or no technical reason why all such engines should not conform to strict limits on noise pollution.

And may I interject again here? Most of these are concerned with people taking pleasure. I don't see why they should take their pleasure and discount my pleasure at the same time. In this context then, where do economics come into it?

The enforcement of strict rules for snowmobiles might well reduce the destructive behavior of some of their users.

Adequate Federal regulations would be given by the administration's bill, S. 1016 and House of Representative's 5275, with amendments taken from Congressmen Tiernan's and Ryan's bill House 6002 and House 6986 respectively, in particular—now, this has been mentioned on several occasions—provisions for citizen suits, and specific contract and procurment rules to insure compliance by Federal contractors, licensees and grantees of Federal regulations. However, the gradual increase in noise levels and the insidious nature of the associated health hazards have left the general public woefully ignorant of the danger to their well-being. And I might include myself here and many conservationists and environmentalists I know. People have the right to know, and provision should be made in any appropriation for a public information campaign. Something of the nature of your project 5000, the clean water advertisements I've seen on television, and evolution. Of course, I think it's slightly out of context, but the advertisements on smoking were, to my mind, beneficial to the general well-being and public health, although perhaps not to tobacco companies' profits.

We all know that laws are useless without adequate enforcement, as the lady who spoke before me mentioned. We have many laws. The Corps of Engineers is recently being—beginning to issue permits on the 19th century law, and I hope they do it judiciously.

Mr. Ruckelshaus has been commendably forth-right in his pronouncements on environmental matters. It is hoped that he will be allowed to match his words with actions. If the administration is as reluctant to fund noise abatement measures as it has been in other environmental legislation, we can expect more noise rather than less.

I hope this series of hearings is productive in this respect. I wish to thank the Office of Noise Abatement and Control, and wish them success in their efforts. We appreciate them.

Dr. MEYER. Thank you very much.

Panel?

Dr. WARD. Well, I don't think we are going to do much about the destructive behavior of snowmobiles or cut down the noise. I think the thing to do with snowmobiles is ban them.

Mr. MADDOX. Well, now, I agree. But a lot of people, friends of mine, enjoy them. I feel that this noise—they are terribly noisy—seems to generate quite mad behavior.

Dr. WARD. I don't believe that.

Mr. **Maddox**. Try taking young children out of a quiet controlled classroom into a noisy environment. I think noise encourages rather outlandish behavior.

Dr. **Ward**. Now, this point has been made before by the previous speaker, and it sounds like the sort of situation that would lend itself to a reasonably scientific investigation. There is a lot of explanation of why children, who have been cooped up in a classroom and forced to sit quiet for some time, when taken to any other environment will start bouncing around, you see.

Mr. **Maddox**. May I make one point? When I say, "A well-controlled classroom," I don't mean a classroom where kids have to sit down and do what they're told. This isn't the way I personally work. They have freedom to go where they want to, in a reasonable way. Not to shout, you know, but to express themselves, to move around. There is no teacher raving at the pupil or anything like that. It's a damn good class where the teacher and children get on well together. But I agree, there are other aspects. For example, taking a class out of a small classroom into a larger space has a similar effect. But certainly taking children into a noisy environment loosens them up.

Dr. **Glorig**. Can we at least say your experiments were not very well controlled?

Mr. **Maddox**. Well, I agree. It's an observation from experience, but I never had the opportunity to do it.

Dr. **Ward**. Well, in brief, speaking of shops, when the boys go to shop, for instance: Well, shop is usually in the afternoon. I just wonder, do these boys—I should ask her, unless she wants to reply from the floor—but are there shop classes in the morning as well as the afternoon? And in that case, are or are not the boys in the morning classes less obstreperous than the ones in the afternoon? If so, then you've got to do things like having the children to wear ear plugs and not wear ear plugs to run the experiments so you can determine whether what you observe is due to the noise or to some other factor.

Mr. **Maddox**. I agree that it isn't a controlled situation. It's an observation that I've noticed and a lot of other people have. I'm not unintelligent enough to perhaps account for this by some other phenomena. But it certainly occurs, and it seems—well, one factor, just to talk to each other, the kids speak louder in doing this. They have to get louder and louder in talking. But it's just an observation of a teacher.

Mr. **Berland**. I wonder if you really meant to say that a fire siren is a necessity?

Mr. **Maddox**. This particular fire station, the entrance is on a sideroad, directly off the corner of a main road, and I really believe it is. Or at least, some warning to drivers. Because watching the drivers on the main road, I'd hate to take a fire engine onto it without a warning in some way.

Mr. **Berland**. I think we agree on the necessity for warning for traffic, but I won't agree with you that an audible signal is the way to do it.

Mr. **Maddox**. Well, no, I didn't really mean to imply that. I should have said, some sort of warning. I must say I'd appreciate some other form. But in fact, it doesn't trouble us too much.

Dr. **Meyer**. Someone has sent up a comment, a question, which is one of these which is rather difficult to know how to handle.

"Are we sure that noise produces madness, or madness results from noise?" I think it's worthy to note that people are thinking about this.

Dr. **Ward**. I think we ought to put that question off until tomorrow when we have the ——

Dr. **Meyer**. Yes, I was going to say we ought to wait until we have our psychiatrist here.

I think one thing we ought to keep in mind too, as long as we're talking about total environment, is that as a member of the Environmental Protection Agency, although my responsibilities relate to noise, I have to be concerned about all aspects. And one thing the Federal Government has really been quite concerned about is the problems you and some other people have raised, about the use of gasoline propelled devices in park areas, particularly those that are propelling two-wheel vehicles such as minibikes, or vehicles such as the snowmobile, where the effect on the actual terrain in terms of tearing up and causing erosion is very great. Now, I'm serving as the Environmental Protection Agency representative on an interagency group that's going to deal with this problem and going to come up with some very specific regulations about the use of minibikes and snowmobiles in National Park areas. This is because, in addition to the noise problem, there is almost as serious a problem with the actual terrain erosion and the effect on vegetation and so on.

Mr. **Maddox**. Don't overlook National Forests. There are probably greater allowances of usage than in the National Parks. I might add on this question, at the National Wildlife Refuge in Oklahoma where, at the time I watched this occurrence, it was being considered by Congress as a wilderness area, an Army helicopter from Fort Sill not only—well, they fly over there quite a lot—landed in what was to be a wilderness area, and nothing was done about it.

Dr. **Meyer**. Well, thank you very much, sir. At this point we were going to take a few minutes' break. Rather than taking a long formalized break, might I suggest—if the panel will consent —that we take about a 5-minute intermission and sort of take a stretch break so we can go ahead.

(At this point a brief recess was taken.)

Dr. **Meyer**. I should like to ask Mr. Dan DeGrassi, conservationist of the city of Dallas, if he is present, to come forward.

Dr. DeGrassi, glad to have you here, sir.

STATEMENT OF DAN DeGRASSI

Mr. **DeGrassi**. Dr. Meyer, panel members, I'd like to address myself to two particular types of noise pollution. One is somewhat out of the ordinary, but it affects us all. This is the noise that comes from cans, bottles, various types of containers of this sort that you can hear rattling across the dumps, the county dumps all across the Nation. The sounds of them breaking and falling, filling in the land, filling in the open spaces, rings loud in the ears of many persons across the Nation.

Now, here in Dallas, there are two types of noise that aren't quite so loud. One is the noise that comes from glass beverage containers; the other is the noise that comes from aluminum and metal beverage containers. Now, the reason for this is there is a particular bottling company here in Dallas that has a recycling program in which they accept bottles and cans, beverage containers only, which is good. But I think that if this is going to be effective, I think they ought to accept all types of glass and metal containers, aluminum, all types of aluminum. I think the Environmental Protection Agency could assist the general public in this way, mainly through educational levels, educating the public, and whatever influence they might have in contributing toward the general recycling program.

And the other type of noise pollution I want to speak on is something that perhaps is more evident. This is the noise that comes from jet aircraft, particularly commercial airliners. I happen to live out by the airport, and I can tell when I've stayed in bed too long because the early morning 747 takes off for San Francisco and lets me know it's time to get up. There are two approaches to this problem I think that can be used. One is to work with the Federal Aviation Agency to effectively muffle jet aircraft, plan the airports outside of urban areas, as the Southwest Airport is being planned. The other approach, a more long range approach, but I think it's perhaps more important, is to reduce the number of aircraft. And the way to do that is to reduce the number of persons using aircraft. And the way to do that is to reduce the number of persons on the earth. And I think the way to do that, the best way, is through effective birth control, population control.

That's it. Thank you.

Dr. **MEYER.** Well, before you go—panel?

Dr. **WARD.** I agree. The best way to do it is to reduce the population level.

Professor **COLE.** That's rather a long-term suggestion. In the interim, what are you going to do?

Mr. **DEGRASSI.** Well, you've got to start sometime, and I think a Federal agency is the best place to start. One other thing I might mention about—you want to talk about pollution. These jets contribute not only to noise pollution, but air pollution. And I notice the weather reports on the local television news stations term the present conditions the last few days here in Dallas as sort of hazy. Hazy is another word for smog. And not only can I hear the jets, but I can also see the smog coming out of the back of them.

Dr. **MEYER.** Thank you very much.

Dr. **Ward**. You know, I'm reminded in this regard of an article that I read and reported on recently. Noise may not be an unmitigated evil. In Italy they compared the size of families where at least one of the parents worked in noise, women in textile mills and men in metal working shops, with a controlled group matched at least for age. Where in the controlled group the percentage of families with two or more children was 69 percent, and it was only 28 percent in the noise-exposed group. And I concluded that what this overpopulated earth needs is, if not more noise, at least a more universal distribution of it.

Dr. **Meyer**. Thank you. Might I at this time ask if Miss Mary Anne Mayer is present? Miss Mayer, please let us hear from you.

STATEMENT OF MISS MARY ANNE MAYER

Miss **Mayer**. My name is Mary Anne Mayer, and I'm a high school student here in Dallas. I'd like to thank the panel for allowing me to speak.

Last spring on a camping trip in East Texas in a National Forest, I heard of the sound of wind blowing through the trees. It was the first time in my 16 years I had ever heard the sound of just wind blowing through the trees. It is a very beautiful and remarkable sound. And I wish I could share the joy I felt when I heard that.

Then again this summer I experience much the same situation as I glided in a canoe on a lake in the Canadian wilderness. Again, a wonderful experience.

I am not so naive or idealistic to think that many people care about such things as the sound of silence. Here in the city we learn to adjust to the hectic life of automobiles, high-speed travel, et cetera. We have to tune out certain things and we don't listen for the sounds of the wind and that sort of thing.

Nevertheless, we must try to achieve an environment worth living in. I'm not going to dwell on that point as many environmentalists do dwell on that point; that turns off a lot of people. But I do have a few suggestions to make, and I hope that they will be of at least some use.

Unlike air and water pollution, the effects of noise pollution are felt directly and immediately. Though many people care little about the static or long-term effects of air pollution, almost everyone hates the many annoying sounds of our technological society. Because of this I feel there is a great wealth of citizen interest involving noise pollution that is yet to be drawn from.

From my own experience in air pollution, I know, as you gentlemen surely know, there is a long road of compromise ahead of you. To the citizen, the person in the street, it's the quality of life versus technological progress, and that's a long hard row. But from my experience in air pollution—it's about 2 years—I believe that citizen pressure is the key, and is the only key, to implementation and enforcement of your findings.

My suggestions then—really one main suggestion—instead of being like a panel that listens to citizens, and then goes back to offices, work with the citizens, long to cooperate with them. I think this will accomplish a lot.

First of all, I think you might find success in the form of public relations, by stimulating public interest in noise pollution. I think you'll find favorable results in several areas. Citizen pressure for enforcement will result, as well as pressure from legislation.

And second, consumers will respond, as far as buying certain things, from the publications of Environmental Action.

In the cases where they claim there is no new technology, it is often the purchaser and not the manufacturer who is at fault. A number of companies announced the creation of quiet products only to find that because of a slight increase in the price, they were essentially unmarketable. Like the construction industry which pours out unbelieveable quantities of noise, the housewife is often guilty. For instance, one large company developed a near-silent vacuum cleaner which, it turned out, was rejected by consumers because the silence was equated with ineffectiveness. Typewriter manufacturers, too, have learned how to make machines quieter, but it's been found that secretaries won't use them because the silence gives the impression of slow typing.

So here again, public relations might help consumers to respond. I think that by working with the citizens, you'll find good results.

And one of my pet peeves—I see Mr. Barnes out there.

This is nothing personal. I don't know if you remember me or not. But Mr. Barnes, now director of the Air Pollution Department in Dallas, and about 2 years ago I invited him to a girls' meeting. And he talked and told us a little bit about pollution, and then I said, "Well, what can we do?" We were all enthusiastic.

He said, "Well, I'm sorry, there's nothing I can think of."

And I have had many bitter thoughts about that since then, because there's a lot we could have done, as far as writing legislators, or anything. Here we were, enthusiastic, idealistic and ready to work. I think you can use this as an example that young people will—everyone, many, many people, are willing to work enthusiastically and work with you, rather than just give you suggestions.

Also, secondly, there is a university in Wisconsin—I believe it's the University of Wisconsin at Winnepeg, I'm not sure—and this university is entirely environmentally oriented. And the way it has courses is much like you were talking about before, teaching everything as social services, everything as a part of man's environment, such as engineering. Everything is involved, an intregral part of the environment. I think this is going to be the answer in education, to make people aware of the environment. You know, not as something separate, but as an intregral part of life. And that includes engineering, everything, science, architecture, et cetera.

Again, I'd like to thank you for giving me this opportunity to speak.

Dr. **MEYER**. Miss Mayer, may I ask you to wait a minute to see if the panel has any questions or comments?

Panel?

Dr. **GLORIG**. I'd just like to say, sometimes I have a lot of misgivings about leaving our world to the youngsters, but when I see them like this, I have no problems at all.

Dr. **MEYER**. Amen. [Applause.]

Does anyone else on the panel have a comment?

Mr. **BERLAND**. Yes. I'd like to mention the lack of success in quiet products. It seems to me that there's a dual responsibility here, one of them, of course, is with the consumer. He must demand quiet products. But I think also the commercial—those who sell quiet products have to spend as much time, energy, and money promoting the quietness benefits as much as the noise. They have always equated noise with power, be it a vacuum cleaner or an automobile. I think it's a question of value.

Dr. **MEYER**. Miss Mayer, your comments have been most useful. And I certainly echo what Dr. Glorig has said. The point you raised about working with young people, particularly in the noise control area, is one that you can rest assured we'll take a look at, because I think that a great deal of some of the problems associated with motorcycles and some of the high energy noise sources can be dealt with by working with youth groups to teach some of the users of these things that they are indeed hurting themselves as well as others. There are many ways you can be advocates for us, with the panelists and with the producers and with everybody. So we're most pleased in having your suggestions.

Miss **MAYER**. But also, it's not just youth. I mean, from all—even big people.

Dr. **MEYER**. That's what I meant, to work within the whole structure here. Thank you very much, young lady.

The Honorable Joe Allen of the Texas House of Representatives was going to be here. Unfortunately, Mr. Allen was called away. He was actually here and then had some emergency arise. He asked that I insert in the record his comments, and it shall so be done.

STATEMENT OF STATE REPRESENTATIVE JOE ALLEN

Representative **ALLEN**. Chairman Meyer, members of the hearing board, I am, of course, honored to have been invited to appear before this panel to discuss the problems of noise pollution and possible legislative remedies and controls.

As you are, I believe, aware, as a member of the Texas House of Representatives, I introduced a bill in the last session of the legislature which would facilitate the establishment of noise pollution standards and control procedures.

My bill, which, to my knowledge, was the first of its kind ever introduced in the Texas Legislature, would authorize the existing

Texas Air Control Board to promulgate rules, regulations, and standards to control excessive noise and provide both civil penalties and injunctive relief in cases of violations.

The reasons for my sponsorship of this measure were several. Foremost, I suppose, was my personal interest and concern with environmental matters. As the text of my bill said, "The legislature finds that excessive noise endangers physical and emotional health and well-being, interferes with legitimate business and recreational activities, increases construction costs, depresses property values, offends the senses, creates public nuisances, and in other respects reduces the quality of the environment."

Those words, "the legislature finds," were more hopeful description than accurate representation of the feelings of the majority in the legislative branch of Texas State government.

Although this was among the first bills introduced in the last session and although it was quickly referred to the Committee on State Affairs, one of the most important and influential committees of the House, this proposed act never came to the floor of the House for debate.

That—in view of the fact that legislative bodies are reluctant to tread too quickly on unexplored ground—was not terribly surprising. The most disappointing aspect of this legislation, so far as I was concerned, however, was the fact that the committee never granted me a hearing on the bill, never opened it for discussion, and never even considered reporting it to the floor.

Thus, one of my principal objectives, short of passage of the bill, was not achieved. I had hoped to call attention to this neglected area of environmental concern.

Pollution is a much discussed subject these days. It has almost achieved the status of a fad. Some of those individuals, industries and organizations which have done the most to destroy the environment now even claim to be society's watchdogs against our pollution enemies.

My impression is that the words "pollution," "environment," and "ecology" are being used more by people to keep their profits up, to establish lucrative new business enterprises and to get elected or reelected to public office than by those who are genuinely concerned about the problems and about finding solutions.

It is a tragic fact, indeed, that so many are attempting to capitalize on a very serious and complex problem—and upon those who recognize it as such—for selfish personal and corporate gain.

Even those who are most concerned with, and most dedicated to eradicating, the threats of pollution, however, are not always aware of the intricacies of the problem or all the various types of pollution.

Everyone, by now, is presumably aware of air and water pollution—the very visible types that we see and smell and taste every day. Most people are even cognizant of the litter problem, but do not connect litter with the related, but monumentally greater problem of solid waste pollution.

People have come to take for granted—to accept and not worry about—certain aspects of our environment, certain very tragic things that we are doing to ourselves and the world around us.

Garbage, for example. Most of us really do not think about our garbage once we have put out the trash for the sanitation men to pick up. Most of us do not ask or care about where it goes. After all, we do not have to think about it or concern ourselves with garbage, unless, of course, we happen to live next to a garbage dump or a landfill site.

We do not have to consider the fact that each of us produces tons of garbage each year—garbage which has to be put somewhere. Tons of trash which must be burned or buried or compressed or recycled or dumped into the sea or piles next to someone's house.

To paraphrase a recent comment of Governor Cahill of New Jersey, we must stop thinking about throwing our garbage away, because there just isn't any "away".

That's solid waste pollution. Litter is a small part of it, but we almost literally cannot see the forest for the twigs on the trees.

I mention it by way of an example to emphasize that there are not simply one or two or three kinds of pollution. There are many—all inextricably intertwined. We see pollution, we smell it, we taste it, we breathe it, we hear it, we feel it. With every sense we perceive that pollution is surrounding us, cramping us, making us ill, and cutting off our life-giving natural resources.

Pollution kills. If it does not kill the body, it must surely kill the soul.

Unfortunately, some forms of pollution have existed for so long that we have acclimated ourselves to them. We do not even realize that they are harmful to us and to other living things. And we do not notice that they are shaping our lives and reducing the quality of life.

Among the many forms of pollution—like air pollution, water pollution, solid waste pollution, nuclear pollution, pesticide pollution, and others—noise pollution is perhaps the most ignored.

It is the neglected stepchild, if you will—even among pollution buffs.

The reasons again are many. Chief among them, I suppose, is that we have become inured to noise.

Because we are used to it does not mean that noise cannot be excessive or that it is not harmful. Indeed, it is—or can be—very harmful.

Although I am not, and will not pretend to be, an expert on medical or psychological damage that can occur as a result of exposure to noise pollution and will allow others to explore this area more fully, I must comment briefly on some of the established facts.

Noise pollution causes hearing loss. Permanent damage occurs when a person is exposed to a sound level of 85 decibels over a period of years, although he may not notice the hearing loss until it is too late to do anything about it.

It is probable that both the decibel level and the duration of exposure are important factors in how much damage is done. The higher the decibel level of a given sound or noise, the more damage can be done in a shorter period of time.

Tolerance for noise varies among individuals, but, for most people, prolonged or repeated exposure to noise levels above 85 decibels is considered dangerous.

Urban traffic sounds often reach 90 decibels or more, and average city noise levels appear to be increasing at the rate of about 1 decibel a year. At this rate, noise-induced deafness may affect most city dwellers by the year 2000.

Exposure, for even 1 minute, to between 100 and 120 decibels of noise (such as the sound of a loud power mower, a motorcycle, or a jet plane on a ramp) can cause temporary deafness.

A shock wave of 130 decibels or more from a riveting gun, an air raid siren or a jet plane at takeoff can conceivably cause immediate, permanent damage. This measure of sound approaches the threshhold of pain for most people.

Various researchers have concluded that, in addition to hearing loss, noise causes a number of other undesireable physiological responses in people, such as heart problems and nervous disorders. In addition, a host of psychological responses are attributed to noise, including annoyance, fear, speech impariment, sleep loss, anxiety, and feelings of loss of privacy.

Noise is said to cause dream interruption, which may result in a variety of psychotic symptoms, including paranoid delusions, psychoses, hallucinations, suicidal tendencies, and general inability to cope with frustration.

The dangers—at least some of them—are clear.

Automobiles, trucks, airplanes, construction equipment, factories, railroads, housecleaning equipment, and loud music all contribute to the din which is characteristic of modern American communities.

Like air and water pollution, most noise pollution is the result of decisions to opt for particular technological possibilities without considering fully their impact on people.

Partly because it cannot be seen, partly because it can often be eliminated or evaded by turning off or moving away from the source, and partly because its effects are not fully known, noise pollution has not received the degree of social concern that has recently been devoted to air and water pollution.

Yet noise pollution has disrupted the environment, it does physical and psychological harm to humans and untold damage to other creatures, and it does require action commensurate with air and water pollution control activities.

More than 20 centuries ago—long before electronic and motor technology ruled and abused the world—Julius Caesar noticed the existence of noise pollution and actually did something about it. The clattering of chariots on the stone pavements of Rome was an annoyance, a nuisance, so he banned the vehicles from the streets of that ancient city.

With all the power of technology and a wealth of scientific knowledge at our disposal to correct the situation, we could react, we should react, and we must react in similar fashion to this threat to our peace and tranquility. We have the ability to rid ourselves of the dangers of noise pollution.

And we must take legislative action—at the State level, the Federal level, or both—to insure that we protect ourselves and succeeding generations.

Dr. **MEYER**. The next person I would like to ask to come forward is Mr. Bob Johnson of the Environmental Action Center of Dallas, Tex.

Is Mr. Johnson here?

STATEMENT OF BOB JOHNSON

Mr. **JOHNSON**. I don't really have much of a statement to make, except that the Environmental Action Center is located a mile and a half from the Love Field terminal. And at times the conversations over the telephone are completely obliterated out there. So we did some tapes to demonstrate. I have them here.

Dr. **MEYER**. Please go ahead, sir.

(At this point recording tapes were played by the witness.)

Dr. **MEYER**. Mr. Johnson, what type of building is that that you're making these recordings in?

Mr. **JOHNSON**. It's an old residential building that's been converted for office use. It's been zoned commercial.

Dr. **MEYER**. A wooden frame?

Mr. **JOHNSON**. Right.

Dr. **MEYER**. Wooden frame?

Mr. **JOHNSON**. (Nods.)

Dr. **MEYER**. You say it's a mile and half away?

Mr. **JOHNSON**. Right.

Dr. **MEYER**. About what time of day was this?

Mr. **JOHNSON**. We did about two or three of them at 5 o'clock and a little bit after. And the others were taped about 11:30 in the morning.

Dr. **MEYER**. Panel, any question or comment?

Mr. **BERLAND**. What we heard, is that what came over the phone?

Mr. **JOHNSON**. Yes. We had to use a microphone on the telephone cup because, like we tried it with the telephone and all we could get was something similar to what the person on the other end of the line would get. But we're in a different situation because you hear the whole thing there with the use of the mike on the telephone.

Dr. **GLORIG**. Was this in the flight pattern, or what?

Mr. **JOHNSON**. Yes. It's approximately two blocks down from being right under the flight pattern.

Dr. **MEYER**. No other questions? Thank you very much. That was a very good demonstration because it shows another one of the problems of really how difficult some kinds of noise can be when one is trying to do what one wants to do. Thank you very much.

Mr. JOHNSON. Thank you.

Dr. MEYER. Ladies and gentlemen, this is the last witness we have for the day. Tomorrow, beginning at 9 o'clock—and I hope we'll start promptly at 9 because we do indeed have a long session—we will be hearing from a series of witnesses who will be talking about both the importance of noise in relation to planning and how one does a better job of planning so that some of the problems we've heard about today do not occur. We will also talk how to deal with some of the specific problems of noise in residential living areas within the home or apartment or other occupied spaces. We think it will be an interesting day and we hope that those of you who can, will return.

This session of this hearing is hereby recessed until tomorrow.

ENVIRONMENTAL PROTECTION AGENCY

Public Hearing on Urban Planning, Architectural Designs and Noise in the Home

PROCEEDINGS

August 19, 1971.

Dr. MEYER. Ladies and gentlemen, I call to order the second day of the public hearing on noise, conducted by the Environment Protection Agency under title IV of Public Law 91-604. Many of the people in the audience were here yesterday, but there are some new faces. And so that they and some of the participants who also were not here yesterday are aware of the authorities and purposes of this hearing, I will say some brief words which may be redundant, but I beg the indulgence of those who have heard them before.

The Environmental Protection Agency is directed by the Congress to hold a series of public hearings relating to noise, and to make a report to the Congress as to the facts about noise as an environmental problem and what might be done about it and what is needed to be done. In preparing that report, the Administrator of the Environmental Protection Agency was also directed to hold a series of public hearings, and this is one of those hearings. From these hearings we are receiving information from public witnesses, testifying as to their attitudes about how noise, unwanted sound, affects them. We are also receiving information from a series of specially invited participants who have knowledge about specific problems as to the noise situation, or what may be done about it.

Today's testimony before this group of experts, who are sitting with me, is to help the Federal Government analyze the information and provide advice and recommendations as related to urban planning, and, as a part of urban planning, the role of architecture. And also the other side of the problem, namely, what goes on in the home.

So without further ado, I will start this morning's session and ask Mr. Robert Pish of the Southwest Research Institute if he would kindly come and join us and give us some information about noise as seen through the eyes of this internationally known research organization.

STATEMENT OF ROBERT H. PISH, SOUTHWEST RESEARCH INSTITUTE

Mr. PISH. Thank you for the plug.

Dr. Meyer, gentlemen, noise has long been recognized as an unwelcome yet seemingly unavoidable companion of our increasingly mechanized and mobilized society. While the noise levels in our communities have been growing steadily, first serious recognition of the problem came from industrial and military circles where, of course, noise levels were most severe. This awareness has now spread to other segments of society, particularly from the standpoint of community annoyance. The recent fervor over the environment and ecology has heightened interest in many of the problems of noise, and in perhaps providing some of the public and political impetus needed to start action to reduce noise, or at least to hold its growth in check. With this public recognition and demand for control comes the allied problem of just how quiet our environment should be, or more precisely, just what criteria can be used for judging and controlling noise without imposing undue penalties on our private and industrial activities.

There are, of course, certain problems inherent in the awakening of a "sleeping giant." We are seeing some of these problems today as public and political pressures are demanding almost instant legislative action in areas where technical data is scarce, and demanding immediate and comprehensive programs for noise reduction without a thorough assessment of the implications of such reduction on product cost and safety.

Basically, if we confine our discussion to residential noise, most of the problems center around noise annoyance. In this category we might also include recreational noise. We are now seeing an invasion of unwanted sound into virtually every facet of man's activity and his leisure. The constant psychological tension placed on individuals by the noise surrounding them, while difficult if not impossible to define in quantitative terms, most certainly exists. The ultimate effect of this continued stimulation depends to a large measure on other coexisting environmental conditions and on each individual's previous conditioning.

There is general agreement that noise can be annoying and that too much noise can be harmful to man's physical and psychological makeup. Here general agreement ceases, however, and disagreement reigns as to how much noise man can stand without ill effect, just what the effects are, and how much variation in sensitivity exists from man to man. Some things are clear, however, at least qualitatively. The annoyance value of noise may not be defined in purely physical terms of pressure and spectra. Leaky faucets and babies' crying very quickly dispel any attempts at blaming annoyance totally on acoustic properties. The problem of preconditioning has plagued researchers for years in their attempts to define noise annoyance factors, and even in statistical approaches, variations in individual susceptibilities have rendered most systematic attacks on the problem questionable at best. Probably the most effective approach has been the study of actual case histories, but here again the problem of the uncontrolled environment has obscured the role of noise alone in inducing annoyance. Perhaps the most popular noise criterion is that by Rosenblith and Stevens.

Recognizing the inaccuracy of data on the effects of noise, many legislative efforts in the field of community noise control have produced relatively poor documents, particularly on the local level. Many of these are unenforceable, unduly restrictive, or technically impractical. Such specifications as "noise cannot exceed background levels" or "residential noise must be 40 dB" where ambient levels are typically 45 dB only serve to muddy the water by establishing unsound precedents. In the cases where legislation is unduly restrictive or technically unachievable, an obvious danger exists in hamstringing industry and interfering with personal comfort and freedom. In other situations where legislation lacks technical preciseness, the regulation itself becomes a nuisance.

At this point I would like to inject a personal comment in that yesterday quite a number of individual citizens were backing or supporting H.R. 6002. While the text of this regulation is in fact very good, certain points which have been overlooked by the citizens are basically wrong or faulty. One part sets noise levels for vehicles at 86 dB(A) without specifying a distance, a measurement point or measurement condition. And I'm sure if we specified under the hood, we could keep most of the cars off the road.

Basically, we may class community noise as originating from any of three major sources: Adjacent industrial facilities, traffic —both ground and air, and residential equipment and appliances.

Industrial noise sources often provide a more or less continuous background to community activities in many areas. The sounds of plant and construction equipment are common in many neighborhoods. However, while a list of these sources may be relatively easy to compile, the implementation of effective control for this noise will be both difficult and costly. The suspension of such activity must be considered only as a last resort. Are we really ready to buy silence with unemployment?

In many cases, black magic is not required to control industrial noise. Control techniques, when requested, may be engineered within the state of the air with fairly predictable results. As an example, compare the stenographer's recorder here to the common office typewriter. The problems are chiefly economic, and the costs can become astronomical for some types of noise. In fact, it is often cheaper to buy up adjacent property around noisy items than reduce noise at its source. In other cases, treatments can be rather effectively and conveniently applied. The release of high pressure steam in an outside blowoff or vent stack, as described by Mrs. Stewart yesterday, the control of engine noise, or many other types of plant noise can be controlled if systematically analyzed and effectively engineered. Over the past 15 years, in fact, Southwest Research has been deeply involved in the control of such industrial noises, both from the standpoint of protecting plant employees and controlling community annoyance. Such work has entailed a rather wide range of problems for many diverse industries. Unfortunately, the majority of our work has been remedial in nature because for most companies noise has not been a problem until a complaint was registered. As a result of many such studies, it is possible to say that the control of noise is significantly more economical in the design stage because at this point the physical layout of the facility and the use of existing terrain features is possible, both of which are free.

Traffic noise is probably one of the most commonly recognized urban noise sources. The majority of noise from surface vehicles, however, is usually related to operation at increased speed or operation in dense traffic flows. Wind noise and tire noise are both functions of vehicle speed and, as such, usually confined to major traffic arteries. Aircraft noise, while more invading, is usually confined similarly to particular air and approach routes.

Because of this facet of vehicular noise, it appears likely that careful planning, design, and construction of traffic arteries, both air and water, and surface, can do much to eliminate this noise at the source in this case.

The residential—and as was pointed out yesterday, the recreational noise sources—present a significant and heretofore uncontrolled problem to a peaceful environment. Unfortunately, it is in the residential area that noise and the control of noise become limited by the subjective responses that are evoked. Typically, a motorcycle enthusiast does not call his motorcycle noisy. While most will agree that the nonpersonal devices such as garbage disposers, air conditioners, furnaces and plumbing make noise, this, however, is where agreement stops. For, over the years, as yesterday's speakers testified, noise has been related to power and consumers will purchase personal devices such as tools, blenders, vacuum cleaners, cars, and lawn mowers because they sound powerful. In fact, manufacturers who have attempted to market quiet products have run into significant buyer resistance. One well known lawn mower manufacturer modified its best selling mower to reduce the noise levels it radiated. After selling many of them, they began to be returned because they were "underpowered," end quote, when in actuality, the buyers who could not hear the machine could not detect that they were overloading the lawnmower, and as a result, were killing it. In a similar example of man's dependence on noise, many of you have driven new cars and seen suddenly the fire truck or the ambulance rush past you or rush into the intersection with you, not having heard its approach. This is perhaps one of the better examples of one adverse effect of noise reduction on personal safety. So we've got both spectra here, too much and too little noise. Many people in driving a car pay less than adequate visual attention, relying on their sense of hearing to alert them to danger. Removing the noise in this case has definitely impaired their safety, or at least required them to reorient their information channels to different senses, a requirement that most humans are not ready to handle.

While it is impossible to say quantitatively how serious the community annoyance problem is, at this point we need only look at the symptoms. As a result of widespread publicity, people are becoming aware that noise is not just something that automatically results from industrialization that must be tolerated. One need only look at the large range of problems, both reported and unreported, to see the impact that noise has on every facet of our daily lives.

I will not try to tie this increase in noise to the population growth rate or to the hourly rate increase in total energy consumption, but just mention that in some cases, the increased sound levels are not due to the increase in sound level of any single device, but rather to the ever increasing number of such devices.

Obviously, then, we must reduce the noise levels to acceptable levels within the realms of possibility and feasibility. But what constitutes an acceptable level? The answer to this question is not simple and is definitely not easily legislated, for there is insufficient research to support any given noise level at this time. As with all of the forms of pollution, we find a large number of people willing to point the accusing finger rather than ask what needs to be done. To place the blame entirely on industry is a mistake, for while it is true that power equipment manufacturers have a long way to go in quieting their equipment, many others have been very active in establishing noise programs and have made significant strides. Examples are numerous, with many firms and professional organizations having active noise programs dating back to the mid and early 1950's, before noise was a popular topic of concern.

I'm not trying to say here that industry does not share the blame. It must, however, be remembered that the corporate and social responsibility is a recent concept and, in addition, that manufacturers can only sell those items for which they have buyers. Unfortunately, with limited exception until recent years, consumers have been unwilling to put a premium on quiet equipment. Simply stated, then, there appears to be three basic needs which must be satisfied before a national noise abatement program can succeed.

First, we must perform some research to quantitize man's subjective response to noise in order that reasonable noise criteria might be established.

Second, public education to the impact of noise pollution and the individual's responsibilities for a quiet environment.

Third, research into the application of available noise abatement techniques to particular problems in the urban society.

The first point has already been discussed, and until this work has begun, the nationwide effort to reduce noise will continue to be hampered by poorly written or unenforceable laws.

The second point, that of public awareness or education, bears some important consideration. For until the consumer is aware that he must demand apartments with well treated ceilings and walls and home appliances which are quiet, industry—and by "industry" I mean also home and apartment builders—will not be required to further reduce noise levels. Here again, it is going to be required that the consumer break the long existing tie between power and radiated noise. Individual education must be oriented so that the ultimate user of the item will rely on sources other than his ear to verify equipment performance.

If we recognize the lack of noise criteria and begin research to develop them, we are still confronted by the question of whether or not equipment noise levels can be reduced to meet the criteria. In answer to this question, it may be stated that while the basic techniques exist for treating most types of noise, development of the practical methods for applying these techniques in many cases requires considerable engineering skill and effort. Practical application techniques, as I have used it here, includes the entire spectrum of the noise reduction problem. That is to say, the application of noise reduction methods must consider not only the absolute reduction in noise, but also the safety, economic and physiological impact of the abatement program.

In conclusion, then, it appears that the need exists for a systematic attack on the urban noise pollution within our country. While many possibilities exist, we feel that at least the points below should be considered.

As a first phase, or a first step, we should begin a nationwide program of equipment noise labeling. This phase should establish standard tests for consumer goods and industrial equipment—say, noise levels in dB(A) or sones at 25 feet, or at 3 feet in the case of blenders—in order that the consumer might have the choice of specifying the quieter equipment. In most cases, legislative action is not required because there are quite a number of existing noise measurement standards in the various professional organizations.

Second, we must begin a program of consumer education. Industrywide efforts to label the noise levels of equipment will be of little value unless the consumer is also educated into the meaning of these figures.

As a sidenote, one lady yesterday mentioned that pollution levels had been reduced 26 percent immediately as the result of legislation. Reducing the noise level by 26 dB is roughly one, one and a half db of noise reduction. We are not calling that adequate.

DR. WARD. I think she said 26 percent, not 26 dB(A).

Mr. PISH. Oh, by 26 percent, I'm sorry. The 26 percent reduction in noise is about a dB and a half, so we can't be satisfied with 26 percent. And therefore, concurrent with the requirement for equipment labeling, there should be a nationwide program to educate the consumer on the meanings and the implications of noise and noise specifications.

And finally, research activity. One of the primary aims of the initial research should be to quantitize man's subjective response to noise. This work will allow us to formulate realistic guidelines for the nationwide noise abatement effort.

In addition, simultaneous research should begin to develop the application methods for existing and future noise reduction techniques in such consumer areas as home construction and appliances. This research might ultimately lead to the formulation of minimum noise specifications or standards for housing construction and also application notes and techniques for the control of urban noise.

As a second and final phase, the establishment of these recommended levels for the environment will result naturally from the work performed in phase I. With a little review, some of the existing community noise criteria might even be adopted as interim noise standards for community levels.

As a result of the labeling requirement, industry will probably have begun noise reduction programs in earnest in an attempt to maintain a competitive position. As a result, when the realistic guidelines for the environment have been set, industry should be well on the way to achieving them.

Finally, only when the consumer understands that he shares in the responsibility for having a quiet environment can a nationwide noise abatement program be effective.

Thank you.

Dr. **MEYER**. Mr. Pish, thank you very much for setting the stage for today's discussions. You and your colleague, Dr. Sparks, have put together a statement which really puts this whole problem in perspective. Panel?

Dr. **WARD**. I agree, this is an excellent presentation, and leaving the point of view that the basic plan should be rating the sounds of these machines in terms of their sounds, and leaving it up to the consumer, rather than by broad sweeping mandates banning everything above a certain level.

I would like to question one statement that you made, though, which is, if I may call your attention to page 2 where you say:

> The constant psychological tension placed on individuals by the noise surrounding them, while difficult if not impossible to define in quantitative terms, most certainly exists.

How do you know it exists if you can't define it in quantitative terms? Now, I realize that maybe you didn't have—you are not responsible for that particular sentence, but since we now have our experts on these things with us, I'd like to bring this up again, because it was something that was said many times yesterday. You know, "everybody knows that," and such-and-such is true, and yet where is the evidence?

Mr. **PISH**. Well, this is—I'm sure you're aware you are putting me on the spot. It was my assistant, by the way. Mr. Berland, in his book, as Mr. Baron and several other writers, have claimed physiological impacts of noise. Dr. Glorig, by contrast, has come out in his writing as having said that this is unsupportable. So no matter what I answer, I'm going to be in trouble.

Dr. **MEYER**. That's the purpose of these hearings. Not to get people in trouble, but to get some differences of opinion and fact out in view.

Mr. **PISH**. I have two children; however, they are not hyperactive, they are normal children, and after a day at the office, I come home, and if they're very exceptionally noisy, I cannot relax, and to me, that's personal evidence.

Quantitative evidence is going to be almost impossible to establish. But as far as my stomach is aware, my kids are a psychological pressure in the home.

Dr. **GLORIG**. This kind of evidence reminds me of "they say." I wonder who "they" is all the time. I've never been able to find out who "they" is in these respects.

Professor **COLE**. You know, you can turn the question around and put the burden of proof on those who say it doesn't exist. Let them prove that it doesn't.

Dr. **GLORIG**. Well, I think the point about that is, if it exists, there should be some way of measuring it. Now, maybe not exactly or precisely, but certainly if something exists, there should be some way of pointing it out rather than saying, "Well, my stomach gets in trouble when my children are noisy." How about Sundays when you are not at the office? Does the noise do the same thing?

Mr. **PISH**. If they're noisy, it does.

Dr. Newman's comment about trees yesterday not having any effect on noise quantitatively but psychologically quite drastically affecting a listener's rating of noise enters in here. If we can't differentiate or we can't break that down or separate noise and other stimuli in the home or in the urban environment, maybe the fact that the kids are climbing all over me while they're screaming is part of the problem. But noise is in there with them, and I don't think we will be able to separate it completely. But it's going to be one of the catalysts.

Dr. **MEYER**. Well, we indeed have with us on the panel a human behavioral science and medical specialist in this area. Dr. Westman, did you have any comment on this at this point?

Dr. **WESTMAN**. Well, I've been primed for my appearance at the hearing today and I understand that the panel is divided in its view of the significance of home noise, particularly that produced by appliances and children. And rather than avoiding the issue and putting it off until later this morning, I'd like to tackle it head on. We can continue our discussion at various points.

First of all, I would agree that the burden of proof is on those who say that household noise is not a problem. I think the consensus of those of us who live in homes is sufficient in scope and depth to indicate that we all, as citizens, are concerned about this, so that the scientists must come to me as a father and tell me that noise is not a problem. So I think the question should be turned around.

Second, we do have clinical evidence available to us today—and again for those of us who may not be familiar with the significance of clinical evidence, clinical evidence is soft evidence.

It's the kind of evidence that a doctor uses in treating a disease that's not fully understood. A doctor is faced with a need to handle a problem that comes to him, and rather than waiting for the laboratory or the scientific research to be completed, he has to do something to solve the problem at hand. So that what I'm going to say now is not based on laboratory or research evidence of a hard type, but it's based on soft, clinical evidence. We certainly do see children, as was pointed out yesterday, and I think that most of us know, who flounder because of the effects of high sound input, both at home and in the school, but more importantly, we do see mothers who come to physicians complaining about everything but noise in the home. The sensitive physician finds that among many things, psychologically, personal relationships and so on, the most significant thing that he can do to help that mother is to ask this question: "Is your home set up to handle grownups who like low sound and low activity levels? Is it also set up to handle children who like high sound and high activity levels?" And looking at it from this point of view, which might be called psychoarchitecture, the tension level of the mother can be reduced by a little thought and a little planning relative to the areas in the home where the children make the noise and the areas in the home in which she or father—when you get home at night—attempt to uncoil from a busy day.

Well, these are the things that I think can be brought to your testimony as a father, as a physician who works in this area.

Dr. MEYER. Thank you very much, Dr. Westman. Panel, any more questions for this witness?

Professor COLE. Yes. On your recommendations on equipment labeling of sound levels, have you talked to any manufacturers about this proposal, and if so, have you had any response from them?

Mr. PISH. Right at this moment, I, as well as my cohort, Cecil Sparks, are members of the Society of Automotive Engineers Tractor Technical Committee, which is seeking to develop a labeling committee for tractors. Several other Society of Automotive Engineering criteria exist for labeling right now in the automotive field.

Professor COLE. Later on I think we have some witnesses to testify from the home appliance manufacturers, and I would appreciate it if they would comment on these recommendations which your testimony has given.

Dr. MEYER. We have two more questions. Do you have one?

Dr. GLORIG. I wanted to ask if you knew that there is an international standard on community response that has been out now for about a year, which takes into account all these things you have been talking about for an interim standard? We worked on this for about 10 years or so, and we gave up the word "annoyance" because it just could not possibly be handled in such an instance, and we changed it to "community response." There is a standard which purports to measure community response with respect to the rating of noise.

Mr. **Pish**. I've seen it.

Dr. **Meyer**. Before you answer, there was a question I was going to ask, and I'd like to add it to this. Could your statement there be construed as saying—taking Dr. Glorig's statement along with it—that you feel that all of these existing standards need—even though they are the result of 10 years work—some further extension and ought to be considered tentative? Is that the thrust of what you're saying?

Mr. **Pish**. Well, while I'm not familiar with this international standards organization or the research that went in behind it, most regulations, even the existing occupational hearing loss regulations, are based on not completely strong and thorough scientific groundings. In talking to Herb Jones about the Public Health Service, he admits that there is some impreciseness or some points of consolidation between industry and the Government that were used in arriving at the final levels, in that the levels that are set are compromises and are not scientifically correct facts.

Dr. **Glorig**. Having been the writer of the thing you are talking about, I agree with you completely. But this is the result of the fact that any recommendation must be supported by the community, and not only the scientific community but the industrial community and the social community and the medical community and the entire population that is going to be affected by the regulation. Therefore, compromises must be made.

Mr. **Pish**. This is right. And one of the biggest fallacies we can have—on some of the existing legislation that is pending right now—is that occupational levels must be reduced to 80 dB, when in fact, most industries will not be able to do that in the near future. And these are not compromises, and not necessarily wrongly based in any practical sense or any practical information.

Dr. **Newman**. I'd like to make an observation on it all, not standards for noise or anything else. When we talk about noise control in any environmental situation, we talk about levels of noise that we can tolerate; kids screaming, planes making noise, and so on. Any noise at reasonable noninjurious levels is more tolerable in a nonreverberant environment than in a reverberant one. And I think one of the things that we vastly underdo in houses is use—use of sound absorbing treatment. People talk about, "This house is so noisy." It's so noisy because it's all hard white plaster and vinyl asbestos floors. And we need to realize that almost any noise situation can be significantly mitigated by the use of sound absorbing treatment, no matter what the level.

Dr. **Meyer**. Ted, you had a question?

Mr. **Berland**. Yes. First, a comment on the psychological effects. I know that when I'm trying to hold a conversation and an airplane flies overhead, it's not only noise, it's frustration, and some other adjectives could be applied. I also know that when I hear a siren, I have a psychological reaction. I'm sure those aren't imagined; I'm sure they're real. I think the burden has to be on the other side.

I do want to ask you about a couple of comments. You said something that is very attractive to me; you said on page 5 that one way to get at traffic noise, both air and surface, is proper design and construction of traffic arteries. And you really did mean air traffic as well; is that right?

Mr. **PISH.** Right.

Mr. **BERLAND.** Would you care to elaborate, because that coincides with a thought we've had.

Mr. **PISH.** Probably Mr. Newman is more qualified in that area than I, because he has worked more with aircraft noise than I have, or at least his firm has. Basically though, the shortening or the increase in the climb rate on takeoff within permissible limits, the switching to some of the newer quited jet engines is possible. The use of remote airports with rapid transit to a central point of dispersement is another feasible approach. However, the removal of an airport to a remote location, as most people in the field of noise control are aware, does not keep noise away from the community because the community builds up around the airport. In most cases, most airports were built out in remote areas to begin with, and they have since been built up around. And so it's as much the community's fault—not only the developers, but also the purchasers of houses in the area—for having these airport noises close above them.

Mr. **BERLAND.** I misunderstood what you said. I thought that you were saying that we should have aircraft rights-of-way established so that airplanes fly over specific routes to get in the airports, and under those routes you could have heavy industry and whatever. For instance, we have railroad rights-of-way established.

Mr. **PISH.** Well, this is one of the many facets of the problem, obviously. The overwater approaches to the port cities of San Francisco and New York have reduced community annoyance aspects to some degree. And these things, in taking advantage of existing terrain features, ridge lines and the like, aircraft approach arteries and takeoff arteries can be greatly silenced or at least removed from our awareness. I want to make one comment back to you, Mr. Berland, in that you mentioned that a siren definitely does annoy you or produce some psychological reaction. In most cases, some of the noises that annoy us, like a baby crying or a siren, don't evoke reactions because of the absolute noise level, but because of the psychological fear of what that sound implies. So that there we're not reacting—we're not psychologically reacting to the noise level, but rather to the implied fear from that.

Mr. **BERLAND.** Well, I don't think that anyone can say—and I don't mean this as a pun—but I don't think you can say that noise can exist in a vacuum.

Dr. **MEYER.** No; it doesn't. At least as far as the members of the panel know, it doesn't.

Mr. **BERLAND**. It certainly doesn't exist in a physiological and psychological vacuum. If I hear it, I don't just hear it with the architecture of my ear; I also hear it with my whole being. So I think that that's right, it does not exist by itself.

Somebody else mentioned yesterday that there's a lawnmower manufacturer that sold a quiet lawnmower and bombed with it. No one has named that manufacturer, and I wonder if you could? I do also know that Scott produces a quiet hand mower, and apparently is very successful with it.

Mr. **PISH**. Well, this is a recent——

Mr. **BERLAND**. Who produced the power mower that was quiet; do you know?

Mr. **PISH**. To the best of my knowledge, it was the Lawn Boy Corp.

Dr. **WARD**. "To the best of your knowledge?" Now, you are putting this into the record. I would prefer that you——

Mr. **PISH**. It was the Lawn Boy. In a similar example——

Dr. **WARD**. Is it printed, this experience, or is this word of mouth concerning the Lawn Boy?

Mr. **PISH**. This is a known example from the manufacturer of the Lawn Boy mower.

Dr. **NEWMAN**. I get a hearing loss from my Lawn Boy when I operate it for an hour.

Mr. **PISH**. It's not silenced, is it?

Dr. **NEWMAN**. No; but damn it——

Mr. **PISH**. OK. The other instances of just this occurrence are in the agricultural industry, which was the topic of another meeting. John Deere Tractor Works has developed a farm tractor which reduces the noise level at the operator's ears with a cab, and the level is reduced to that of a residential area, a quiet residential area, not necessarily a Dallas residential area. And they are unable to sell them because their marketing research has proven that they cannot market a tractor cab that sells for over a thousand dollars, and a quiet cab will sell for considerably more than that.

Dr. **MEYER**. For the panel's information some information on the subject of economics—at least, in the field of heavy construction equipment—was adduced at our hearing in Atlanta somewhat along the lines that have just been brought out. And I think some of the panel members know that the record does show rather clearly in the heavy construction industry that when a manufacturer introduces quiet presses, even at a modest premium increase of about $200 on an item that's worth about $20,000, he had difficulty in selling them.

Any other questions, panel?

Dr. **WARD**. Can I please have one last question?

Dr. **MEYER**. You may indeed.

Dr. **WARD**. None of my compatriots here has attacked this notion that the burden of proof is on the negative. Are we supposed to believe any proposition, no matter how preposterous, until it is proven false?

Professor **COLE**. No.

Dr. **WARD**. Well, the burden of proof has traditionally been on the affirmative, and although this is in the time of change and upheaval and all sorts of things, it doesn't seem to me that this is the time that we should put the burden of proof on the negative. So I insist that in the realm of extra-auditory effects of noise, the burden of proof still remains on the affirmative, those who declare that in addition to hearing loss, that there are other long term permanent changes that are caused by moderate noise. Now, there is no question but what it is true that sirens annoy this many. They annoy me, but there are some people it doesn't annoy a bit. If they are not universal annoyances—if the annoyance isn't universally true—do we have any right or reason to legislate noises that are annoying only to a few people? This is a question that I think is very important.

Dr. **MEYER**. Well, I can see that our hearing in Boston dealing with the problems of physiological and psychological effects on many are going to be quite stimulating. And if any of you want to hear the rest of this interesting continued story, and can afford to come to Boston in a few weeks, I'm sure you will hear Dr. Ward and some of these other people—not necessarily as panelists but as witnesses and participants, and also as panelists—in continuing this important subject, which we cannot resolve, of course, in this hearing. But the points you are raising are well made. It proves—in the chairman's view, at least—that there are in most of these issues dealing with the environment, not just two sides, but a number of sides. And one of the things that is my chore for the Administrator and the Congress is to try to get as much fact as I can on all sides of the issues.

Thank you very much for helping us get this off to what appears to be a stimulating day.

Now, since some trends in the discussions here were of the nature that they were, I'd like to try to maintain some continuity. And it is the chairman's prerogative to change the order, although there is a logical sequence in the way we have the witnesses arranged. The morning is devoted primarily to matters relating to planning and architecture and the afternoon is devoted primarily to the things that go into the home. And there was a bridge, sort of, between the two somewhat distinct areas. But since Mr. John Burdis of the Environistics Division, Instrument Systems Corp., has had some experiences which sort of follow right on to the previous witnesses, I'm going to take the liberty of asking Mr. Burdis to give his statement now, because I think you'll see the logic of my making that decision of having the bridge here instead of later. Mr. Burdis, nice to have you with us.

STATEMENT OF JOHN BURDIS, INSTRUMENT SYSTEMS CORPORATION

Mr. BURDIS. I suppose I could say I could make a great deal of noise myself, being an architectural planner and a flier, but I prefer to stay in the planning field today and deal with a proposition that I want to put forward as I progress through my paper.

We have technically been able to totally analyze noise and sounds as separate elements, or in a direct relationship to a specific function, i.e., to work at an industrial machine or a sonic boom detector that the Federal Aviation Authority needs in measuring aircraft noises. These are, however, isolated, and like most other investigations, unrelated to the need for a systems approach to change. And change is the one fixed element in our society. We must now assemble our known technology and remove its blinkers to determine the lateral affiliations, direct and indirect associations, to our changing life styles.

I am, then, creating a new toolbox assembly of mostly known components to decide a new system, the esthetic and master enviral plan of sound as an integrated dimension of metro and regional planning. In community land use, we have manmade and natural elements, trees, houses, roads, factories, stores, schools. And in community noise we have assembled identifiable planned components, frequency characteristics, day, night, stationary or moving objects above and below ground, single and multiple, the sounds of comfort or intrusion. We must integrate the noise or sound components with those of the master plan, and we must be classified—they must be classified, rather, by their relationship to land use and to physical buildings if we are to get a totally integrated solution. Let us then analyze the planned components and identify their sounds in our environment.

I would hasten to add that the natural elements of any plan seem to consistently give off pleasant sounds in our environment.

I would hasten to add that the natural elements of any plan seem to consistently give off pleasant sounds, the wind in the trees, the waterfall, wildlife in their habitat, and I will not presume to judge God's work. Rather my evaluation will be man's miserable attempts, to quote, "better" his environment in this brave new world.

So then I'm talking about the esthetics of noise to a large extent broken down into planned components and in the final analysis, the measurements that we deal with in planning as they are related to zoning.

Obviously, in transportation, we have the automobile; it is here. It kind of got large; now it's getting smaller. And as we get smaller, the varying types of motorcycle—I have three in my driveway—I find that as the machine gets smaller, the noise gets greater.

But I'd like to talk about, not so much the vehicles themselves, in which I think we're doing a great deal of work. And I don't want to isolate this into a technical discussion. I want to talk about the assemblage of all of these things. That the actual standards established in the Federal Government for highways do not in any way take into account the question of major arteries being depressed rather than elevated. That in itself would have a tremendous effect on sounds in our urban scene. As Planning Director in one of the largest counties in the country, Long Island, we fought the issue of grade separation of rail and road grade crossing separations. Well, of course, it's cheaper to elevate, but that to me is not the answer. Are we talking about a capital investment—a capital expenditure, rather, or are we talking about an investment in the value of our environment. Their argument was, "Well, if you depress it, it fills with dirt. If you elevate it, all the land uses can go on underneath it." Well, we did this. We had the Third Avenue El which used to go along the sidewalk. In those days, you had to dodge out on the road to get away from the sparks. They then put it in the middle of the road, and they finally got rid of it altogether. Now, they are trying to elevate it once more. Out in Long Island they don't seem to learn.

And there is no question of noise; highway sounds are relatively low as we have an average speed on the Long Island Expressway of about 4 and a half miles an hour.

Coming to the airport yesterday, the man next to me wound his window down and said, "Let me through. I have a message for Grover Cleveland." Well, then if we take this whole question of depressing our major arteries of roads and rails and getting to a grade separation situation, I think we'll alleviate a great deal of the problems. Landscaping, not only is an esthetically important thing—and Robert Moses did a great job for us, especially on Long Island, where he landscaped beautifully all the parkways. Some people say they don't absorb noise. We have the year-round rather dense landscaping. Perhaps it visually absorbs noise. And I volunteer that this is an element that is quite important. Not only that, they absorb a tremendous amount of dirt, and in some instances they keep down the teenage sharpshooters who are rather busy on our major arteries in the last few years in this great world of permissiveness.

As far as planes are concerned, I was faced 4 years ago with the collision course between—well, not actually—but a collision course between Kennedy Airport and one of the towns in my domain, which was the town of Hempstead, the largest single township in the United States. We were faced with the problem where land was totally legislated by a zoning ordinance. The zoning ordinance took into account easements and rights-of-way and all the other elements that could affect its use. The zoning ordinance controlled the setback of the buildings, the side yards, the garages, and there are some 16 measurements you can apply to any individual lot under the enabling legsilation in the State of New York. But it did nothing for any of the space or the air rights above this piece of land, but it controlled everything below. I submit that we have to start—if we're talking about our total environment, we have to start thinking three dimensionally in what has been a two dimensional legal world. The attorney thinks only two dimensionally in the zoning ordinance and it has become a mathematical monotonizer of our land. By thinking three dimensionally, I submit that we can take in air rights to a much greater degree. Now, we do have some moves in this area where air rights themselves—that is, the space above arteries—may be used for certain facilities. We have three masses of apartment buildings built over the approaches to the George Washington Bridge. But I want to go further than that and say that the airlanes—and it was alluded this morning earlier—that the airlanes be mapped on all subdivision and master plan maps, and that they become just as important a component as the easements and the rights-of-way that the attorneys maintain must be on all of the filed maps today. In this way me can begin to protect the airport, the ogre, so to speak. We can establish aircraft lanes, for which there will be at various points of approaches and takeoff fully determined patterns of land use which are adopted in the zoning ordinance and with an integrated building code that establishes sound levels in the building. In this way we protect the airfield and, in many cases, I believe, the pilots themselves in the so-called evasive actions they have to take on takeoff.

I also submit that the zoning ordinance itself is a document in our society that has to be drastically reorganized and extended far beyond its present operation. I said a moment ago that it must become three dimensional, and to become three dimensional, it has to add to all of its land uses behavioral patterns in sound which can be mathematically established so that we can determine relationships between certain kinds of land uses.

I believe, then, that standards and criteria can be prepared for all different kinds of land uses, for urban and suburban and similar rural settings, whereby the zoning ordinance can translate sound needs in any master plan. And then the municipality that screams for home rule can begin to protect itself and the residents that it watches over.

Thank you.

Dr. MEYER. Mr. Burdis, thank you very much for an extremely fresh viewpoint on some of the problems which both the panel is looking at today and which the Federal Government, through our Agency and the other agencies of the Government, must address itself to. Panel, questions?

Mr. BERLAND. Yes. Mr. Burdis, naturally, I agree with the idea about the airlines. You mentioned the problem of zoning. And it's the view of many experts—maybe including yourself, I don't know—that the zoning as practiced in the United States has largely been a failure, largely because of lack of foresight. Would you propose, or is it your idea that such zoning, specifically in terms of the use of air rights in terms of airliners, would you propose that such zoning be thoroughly controlled, or by some governmental agency larger than, say, a community or county?

Mr. **BURDIS**. Well, when you talk about Federal controls, I don't believe that zoning ordinances can be properly federally controlled. I think that the home rule element is fundamental to good zoning. It's a question of level. I personally believe in regional zoning. My county, Nassau, for example, has three towns, two cities and 66 villages, all with their own zoning ordinances, along with some 342 special districts which included two elevated districts for the Long Island Railroad. So you have a real problem when you face this type of thing. So it is a regional type of thing. Perhaps the right of control at the Federal or State level can be applied to certain functions of our life, the services of our life. Utility companies have a right of eminent domain; perhaps the FAA can have some domain, some domain rights over the precluding of certain land uses on assigned flight patterns, and then leave it to the local municipal authorities to create an ordinance within that framework.

Dr. **MEYER**. That's an interesting thought.

Professor **COLE**. Mr. Burdis, I think separate from relating to the terms of zoning ordinances and regulations, I think what you're—as I understand what you're suggesting or recommending is something that goes far beyond zoning laws. I think you should call it something else, a land use control mechanism of some sort.

Mr. **BURDIS**. I think that's why I emphasized zoning is, from a practical viewpoint, it's the only tool of manipulation we have today.

Professor **COLE**. Well, not completely.

Dr. **MEYER**. Well, I think the point you're raising is a good one. We get hung up on semantics sometimes rather than what it is we are trying to do. Maybe that's one of the things—you're giving us some nudges—that we in the Environmental Protection Agency might take a look at, to make it up with the existing system and still get the objective.

Now, any other questions, Ted or Dr. Newman or anybody?

Professor **COLE**. I have one.

Dr. **MEYER**. Oh, excuse me.

Professor **COLE**. We have another—later on in the day we have a witness from a regional council of governments here, and I wish, if he has the time, to comment or react to Mr. Burdis' suggestions.

Dr. **MEYER**. I hope he will. Any other questions, panel?

Mr. **BERLAND**. Just one comment: I noticed Mr. Burdis comes from Jericho.

Mr. **BURDIS**. Well, my initials are J. C., but that doesn't give me any special——

Dr. **MEYER**. Mr. Burdis, thank you so much. We'll be wanting to talk to you some more about some of your ideas.

We now turn to Mr. Bart Spano of Polysonics, who will talk to us at the other extreme of some of the problems more related to within the home, and then we'll get back to planning problems. Mr. Spano, glad you could be here.

STATEMENT OF BART SPANO, POLYSONICS ACOUSTICAL ENGINEERS

Mr. **Spano**. If you don't mind, I'd like to talk standing.

Dr. **Meyer**. It's our pleasure for you to do what makes you most comfortable, sir.

Mr. **Spano**. This is a bright environment, I must say.

My name is Bart Spano; I'm a registered professional engineer in acoustics. I'm with an acoustical consultant firm, Polysonics Acoustical Engineers, Washington, D.C., and I appreciate the opportunity to testify before this group very much.

I want to apologize in advance because, in part, I'll speak from anger but with great hope. I want to talk about really two subjects, quality and ignorance. And I want to address it to the title of the subject today, "The State of the Art, Home Noise". Home noise, including both high rise as well as regular homes.

I was impressed by the two previous speakers for several reasons: One, it illustrated very emphatically that priorities are necessary, very emphatically. There's so much to be done, and we will have to be careful and do the right things first. Home appliances are a nuisance, but they are under the control of the individual who turns them on and who turns them off, and they are temporary. And they are not that critical. There were some questions about hard evidence. I want to produce hard evidence from many years of experience in listening to hard evidence, also hearsay. And I'm glad Dr. Ward is on the panel. He strikes me as the devil's advocate, and I think that's good. And I'm glad there is some disagreement on the panel.

Dr. **Meyer**. We constructed it that way purposely.

Mr. **Spano**. I'm sure you did.

All right. A case history. A brand new apartment house in a city of 3 million, just completed, families moved into the lower three floors. And one of the points in the advertisement, the promotion, was, "revolutionary soundproofing," and they put great emphasis on it. Now, a lot of people are more noise-sensitive than others. And that attracted them, and they moved into this apartment house only to find that the noise, in reality, was terrible, worse than some of the old tenement houses. And we were called in to investigate. What had happened simply was the load bearing walls between apartments—every fourth apartment had load bearing walls instead of the usual column and concrete slab, flat slab construction. And because of these rather massive walls that were to hold the building system and the rest of the building up, between those two apartments they had 62 STC, which is a very high noise reduction between apartments. But where the other three walls existed, they just had a 35 STC wall that only went to the ceiling that was hung from above, a very poor design system. And the floor system was a steel joist concrete topping system that was very bad on impact noise and very bad on airborne. And people moving into a high rise normally expect the flat slab construction with good resistance to impact noise, dropping things on the floor and being heard, and fairly good on airborne noise, loudspeaking or hi-fi systems. But through this floor system, why, the noise went through much worse than a real poorly made house.

So here is an owner who really believed what the architect told him, that revolutionary soundproofing was taking place. And the architect believed it. And they weren't aware that when they went to this light floor construction, which was now allowed by this load bearing wall, that they were going to have a very poor building in terms of impact noise and in terms of noise reduction, airborne noise through the system. And also the other walls that they put in were unusually poor.

Now, here is a building just finished, the owner and the architect really believed they were going to have a great building, and it's terrible. So ignorance is one of the real problems we face today. There are too many architects who go on building and are oblivious of acoustical requirements, and the state of the art is beautifully defined. There are plenty of good floor systems that are competitive; there are plenty of good dry wall systems and other systems for party walls, but somehow the architects don't get the word. So the building owner is victimized in a sense unintentionally, but the real victim is the tenant. Because the tenant moves in and there's no one up above, no one on either side in this brand new building, and they are delighted, until the children move in above and start dropping things, and then the complaints and the hard evidence really rolls in. Threats to move out immediately, sue them for all the moving costs, not pay rent until it's corrected, and the building owner in an absolute fit is the second phase. The third phase, he's about to go to FHA for loans, he has to change the design, stop all the financial arrangements, and a dilemma, an absolute dilemma has occurred. So there's hard evidence of this type all the time.

And let's look at another case. A hospital built 4 years ago, and the mechanical engineers and the mechanical contractors were advised, and the architect—now remember this is a hospital that has to be real quiet, ST 30, and a penthouse machinery room. Well, the pumps were placed on a cork pad, and they decided that to make sure they got good isolation, rather than put a little corner pad between the pump and the floor, they put a pad under the entire pump. Now, it so happens that isolation material has to be loaded within a rather close tolerance, 50 pounds per square inch. And when it gets that load, it acts as an isolator. But when it gets 3 pounds per square inch, it might as well have been pine boards. There is no isolation at all.

So the owners of the hospital and the architect heard this terrible noise of pure tone at 105 cycles, something like hum-m-m. And the pure tone is particularly annoying, more than the sound level meters will say. And so they looked at the isolation and they said, "Now, there's plenty of isolation here. The whole thing is covered." So they went after the pump manufacturer. To make it short, they spent 4 years fooling around, and they finally somehow came to us. We looked at it, we put springs and three layers of pads and corrected it immediately. It could have been done at the very beginning, 4 years ago. And there's all kinds of payments held off, lawsuits were pending against the architect, a shambles of hard evidence. It happens all the time.

We live really in an acoustical jungle, only because most people who are building buildings around this country really don't know what to do. And yet, the know-how for these simple things are existent, they are everywhere in terms of a few who know. But dissemination—and EPA, we look to you to send out little pamphlets, little guides, do's and don't's in isolating penthouse machinery. Something simple, pictures, like "Do"—"Don't."

Because we live in an idiot world, construction is being rushed and it's being cheapened, because every year the costs are going up and buildings are always coming in over budget. And the first thing that happens when they have to cut a building down because it's over budget and the insurance company or lending institution hasn't put up that much money, the first thing that goes is the acoustical isolation. The basic things like heating and cooling and the fancy lobby for market research analysis, that stays.

So it seems to me that one nice function that EPA could do is little consumer bulletins directed to a mass market, a mass media of mechanical engineers and the architects and the mechanical contractors, showing them some case histories, for example, like the two I explained. Another—well, I don't want to go on with too many of these; it hurts too much when I remember them.

But a couple of more cases. Post-tension concrete, a new concrete system whereby instead of laying steel rods for reinforcement, they lay in cables that look like elevator cables, pretty hefty. And they're laid in a packaged state in grease wrapped paper, the concrete is poured, and then at the end of the hardening of the concrete and certain strength developing, they pull on these cables until there is 30,000 or 40,000 pounds of force. This cable tends to pull the concrete together. You've got a layer of concrete, a cable running through it every few feet and they are tightened up at this end, thereby post-tensioning the concrete to develop a greater strength for the same thickness. So the first thing they do, of course, is they make it thinner. Then you start to go into a thin massless floor elastic system, and the impact noise rating goes to pieces. So some of the new systems keep coming in without people catching up with them to warn of acoustical and vibration problems. And here's another of the acoustical jungles.

They decided that they would go to 40-foot column spacing on a high rise building, because the post-tension concrete gave them so much greater strength that they could go to this extreme spacing. The penthouse machinery room had a slab with the same 40-foot spacing. As far as I'm concerned, as we look at it as acoustical engineers, it wasn't a platform for 500 pounds of throbbing, vibrating machinery; it was a trampoline. Because it virtually had a 1½-inch static deflection when it was fully loaded. Well, ¾-inch springs were put under the fans, and the first thing you know, secretaries started to complain of dizziness on the top floor because the building was vibrating so seriously.

Now, I know we laugh at this, and I laughed at it too. But it's a tragic thing. It's really a tragic thing. This is a solid block building, that is, it covered an entire block. It cost about 14 million 2½ years ago and was one of the first with post-tension concrete, and no one took into account that since the floor system on which the pumps and fans and boilers and chiller compressors would work would be working against an extremely limber floor system, that if you put in fairly stiff springs, the floor would act as a spring and the springs would stay stiff. And that's just what happened. So the building vibrated violently. Now, the case there, that was getting a little more sophisticated, changing from ¾-inch springs to 4-inch springs solved the problem.

But again, a year and a half went by with tenants moving in and out, lawsuits by the mechanical contractor because he wasn't being paid his final payment because the building vibrated too much. Everyone pointed to everyone else as to who was at fault. The pump people and the fan people were called in and they were told that their fans were no good, that's why there was so much trouble. And they fought with them for a long period. Again, this agonizing period before someone—an acoustical firm like my own and so many others could have come in with the knowledge and straightened it out, and done it quickly. So again, ignorance and hard evidence.

Labeling. That was an interesting point brought up earlier, and I like it. I came up with this idea here a little while back. A person moves into an apartment house and they read, "Revolutionary soundproofing." And they may believe it. And they move in, and then later they find that it wasn't so at all. But again, through honest mistakes, through ignorance, and yet what has happened, here is a family that has moved, spent a lot of time and effort, bought furniture and the various other things, and now they're living in an environment that is really upsetting them. And what do you do to the building? Well, you can't do much to a massless poured building. You can improve the wall a little bit, but you know, nothing really could be done. It's one of those things that once the building is done, the best you can do is lower the rent, try to get non-noise-sensitive people to move into it, and struggle along with it, because we've never really seen a building that was basically built wrong ever really acoustically corrected.

Now, labeling. Why not EPA put out consumer guides, using FHA standards, saying that if you get a 50 STC wall as a party wall that's not too bad. And if you get a floor that's a 6-inch dense concrete slab and the column spacing is not more than, say, 25 feet both ways, you'll probably get a 75 STC, which is fairly good. And why not start to propose the setting up of standards, not only as FHA has for guaranteed loans, but all, a national recommended code where walls up to a certain rental rate would have to be at least 50 STC, floors at least 55 STC and so forth. At least a recommended code, because getting a law passed is going to take a long time; and we need it, we need it right away. So a recommended code, you don't need authority or congressional action, and I hope that you start getting out recommended codes of that type.

And then recommendations about labeling. When they say, "Revolutionary soundproofing," if I can use this phrase, put their money where their mouth is. What is the STC? And was it actually tested? Because very often they will start off designing a building, and they'll put good walls in the design, but then when it's over budget, they pull the fiberglass out of the cavities, electrical boxes go in back-to-back, and the first thing you know, what started out great turns out to be a poor building. So you need inspections and you need someone to check the building afterwards, and then put down what the wall ratings are and what the floor ratings are. And also how much noise the fan coil units make.

I have another interesting comment, and I was very pleased to hear Dr. Newman speak about overly reverberant rooms being a problem. One of the solutions in an apartment house that has these massless bar joist concrete topping floors is impact noise is very poor, meaning footfalls, spike heels, dropping things, you hear it as a blow below. Now, our proposal was, in their next phase to get rid of wood flooring—they had parquet wood floors—instead, put carpeting in directly. Because invariably there is a requirement saying that 85 percent of the walking areas have to be covered by carpet. So it means that you put in a wood flooring system at 45 cents a square foot, and immediately upon the tenant's moving in, they have to cover 85 percent and it's never seen again. Now, when you add carpet and you get less impact noise, that is, not hearing blows or things dropping above, you get an adequate isolation by adding the carpet by the lease requirement, the floor underneath is now serving no purpose, except having cost 45 cents a square foot. Now, what we are urging—and this nationally—is that wood floors are archaic and vestigious in apartments—in high rise apartment construction—and instead they should be furnished with carpet by the owner to start with. Now, this has a lot of interesting possibilities: One, instead of walking in when you have, say, a young couple just starting out and you have a large apartment or a moderate sized one, no carpets, very little furniture, the rooms are extremely reverberant and very uncommodious. If the apartment is furnished with carpet the minute you move in, the reverb time is substantially lowered; it's an acoustically softer room, and it's much more commodious. Now, many people may walk into a hard room, find it uncommodious, and not know why, not know that it was just excessive reverberation. But it's a very real fact that when your little computer is working up here and you're subconsciously looking at a room, and you're saying to yourself, "It's not very nice." Certainly reverberation must be one of the major factors in that programing of the computer. So by putting in carpet, getting rid of the wooden floors, on a two-bedroom apartment it would only run $5 a month for a 3-year period and then the carpet is completely paid for. Now, what does this do? It guarantees a good impact noise rating; that is, isolation from dropping things to the people below. It gives a soft, comfortable room to move in, it gives you a touch of luxury rather than hard floors. So I'd like to suggest that EPA look into this and see if they can get builders to break away from this feeling, "Oh, you've got to have wood floors." I don't think this is the way it should be. I think that since they show model apartments, they could show them with carpets. There are a lot of colors. They don't see the apartment before they move into it, the physical apartment, generally. They look at model apartments. So they won't be going into an apartment with a concrete floor waiting for the carpet. That's one of the arguments that builders have. Another thing is, carpets are getting better and cheaper and easier to clean all the time.

I have a note here that if the Government requires by law that a 30 cent can of soup has to identify everything that's inside, why can't apartments that cost several thousand dollars enjoy equal rights?

One other thing I want to point out quickly on the blackboard. Noise sensitivity—and it was one of Dr. Newman's men that started me off on this a number of years ago, and I found it to be so real. Now, this is, the percent of people and this is relative noise sensitivity. Now, it so happens—oversimplifying tremendously—that 10 percent of the people in the United States are really noise sensitive, and you could never design an apartment house or other things that would really suit them. That's this 10 percent over here, ultrasensitive. Also, roughly, there's another 10 percent in the United States who are totally insensitive to noise. It just doesn't bother them; they might even like it. This 10 percent. Then there's the 80 percent, the great mass of all of us, right in the middle. And gradually, from people who are not sensitive to noise at all, you start to get more and more people becoming increasingly more noise sensitive, and this is the norm for which we design. If it's a low rent house, young people, we might design over here. If it's a luxurious condominium where people are exacting in everything, including high acoustical privacy, we may start to design over here. The higher the rent, the more this curve obviously shifts to the right. So people should find out, are they noise sensitive or not. Under this consumer guide labeling system, they start looking for apartments. Because if they're not noise sensitive, they might find a lower cost apartment where the noise doesn't bother them and where lower ratings would be completely adequate. If they're noise sensitive, they may start to realize they may have to pay for it in terms of better construction.

There is one other thing that needs work, and that is walls that we've used for a while, 50 and 55 STC as party walls—that's about a 50 or 55 decibel reduction under the standard test system, STC—have been all right, but they have been based on speech. A husband shouting at a wife, for example, a 55 STC wall might handle it and you just hear a "hum-hum," at the other end, an unintelligible blur that's not so noisy, but there's something new on the scene that now says the STC system is not working, and that's stereo. There are too many bass boost fiends around that will turn up their stereo to a 110 at very low frequency, and the low frequencies pulse through the most massive wall systems and are causing very serious problems. Now, stereos are becoming more commonplace all the time, and this business of using just the human voice frequency range as a criteria as to how to rate a wall to give good privacy between apartments is beginning to come apart with too many stereos around. And we have to change; greater stiffness probably is one of the things that would improve the wall system. And I think that EPA should get a little work going on that and stir up a little fuss. It would be a real help.

Now, I said at the beginning I was going to talk about quality and ignorance. I think I've talked enough about the ignorance. Now, quality.

We want to improve the quality of our environment. We want apartments that when we go home at night is a refuge. We stand the noise of the office and downtown, but when we get home we feel, "Boy, I'm going home. I'll have some quiet. I can recover." And we want to improve the quality of that refuge we have. Now, quality costs money, and that's all there is to it. And every time we talk about the environment as poor, it's because we're in a competitive society where to sell a new product, you have to sell it cheaper. And when you sell it cheaper, things start to degrade. They will meet their original performance, like centrifugal fans in a building, in the cooling system of a high rise apartment. The first thing that starts to fail is that when they build it a little less costly, it gets noisier. That seems to be one of the penalties you pay. And in today's high building costs, we are running into a real problem, and that a competition is very stiff, the costs are going up all the time because of the way the economy has been going, and we now find that the builder or owner or mechanical engineer starts to pick the little less costly fan. And as he does this, he is building a noisier building. And once the fan is in and all closed in and the building is turned on and it's too noisy, it's plain trouble for a long time trying to correct it. Now, this whole business of competition in our society is a great thing, but in some areas it does not work. Take automobiles. I would think that if there weren't safety standards which are severe and numerous, tremendous numbers of them, that cars would be cheaper and 10 times more dangerous. Now, I don't say that as anything provocative. Well, I guess it is provocative. It's just that I'm theorizing. I'm simply trying to use that in the abstract as a point that competition is great, but when you want certain minimum standards, competition will not do it for you. You have to establish the minimum standards.

Now, it seems to me that there should be something like NC 35 established, first by EPA as a recommended standard for anything that's running in a building, fans, compressors, and boilers, and the like, to avoid this constant cheapening and increase of noise and vibration. Now, unfortunately, there are a lot of cheaper products coming on the market all the time. Centrifugal fans are one that give us a great deal of trouble. They are very difficult to correct once they are in a building, closed up; and there are a number of others. One of them, for example, is plastic waste pipe. Now, plumbing noise is one of the worst problems we have in high rise apartments. We have good walls, we have good floor systems, we can isolate our machinery fairly well if we're careful, but plumbing noise, hearing the toilets flush, hearing the sinks, hearing the showers going off, in high rise apartments, do not to this day—at least on the domestic supply side, that's the hot and cold running water—have a real practical, more reasonable solution. And it needs work, it needs work badly. Now, this is one area where, for once something good has come along. And that is, the waste pipe system, traditionally this cast iron, lead, oakum joint always has done a reasonably good job because it has very high mass in the cast iron. And it's relatively hard to vibrate and has relatively thick walls so that flushing noise and other obnoxious noise would not go through the wall and then, touching whatever it may, radiate out a sound into your apartment. Now, a new system came out 3 years ago where the lead oakum was replaced by a rubber gasket, and this rubber gasket provides a vibration break at every joint. Now, this is tremendous and almost too good to be true because by changing from lead oakum to the neoprene gasket, we found that builders didn't find an increase in cost. And when we asked to change to this isolation system, we got it at no change in cost. And we were guaranteed an isolation system in the whole waste pipe.

Now, obnoxious noises, personal noises, are more aggravating than the impersonal noises. Like a disposer going off is, to an extent, impersonal, or a sink being run. But a toilet being flushed is a personal obnoxious noise and can carry more complaints than the impersonal noises. So the waste pipe system is an area that has been one that could have some improvement in it, and we have that improvement.

Now, I have here—I also have some slides. I wonder if we could set up that slide system. And I wonder if we could take the screen and put it here and take the slides and put them right over there.

May I take off my coat, please?

Dr. **Meyer**. You may.

Mr. **Spano**. Thank you.

This is the traditional lead oakum joint used in waste pipe systems, and here is cork oakum driven in with a hammer and a chisel or a tamper, and then lead is poured in, and that gives a very compact joint. It's been used for many, many years and it's a very successful system. The way it has been changed simply is that instead of having to have the lead hot and caulking, a lot of handwork, a simple rubber gasket made of neoprene, which is a very high quality, very resistant material, is simply slipped in between, and the pipe is driven in. This system allows a vibration break at every joint. And where you have a disposer, for example, and a disposer is turned on in the apartment, you can hear it sometimes for five or 10 apartments around this entire area of where the disposer goes off. Vibration goes into the waste pipe system, runs along the pipe walls, and then where it touches the apartment wall, excites them in a vibration manner, causing them to radiate it out as sound. Now, with this system, that disposer problem has essentially vanished, because we can get as high as 5 to 15 decibels drop per joint. Now we were very interested because for the first time we found a product had come on the market, it didn't cost any more, and it gave us a tremendous amount of isolation. And it was in one of the areas, plumbing noise, that's high in apartment noise complaints.

So we undertook a series of tests to compare how much better this was than the old lead joint. What was the vibration level that went through galvanized steel, through copper pipe used as a waste system and through this plastic pipe system, to see in hard numbers whether this was hearsay, or just an evaluation by sight, or whether we could get these hard evidence numbers. And I'd like to show the results.

Now, I might say this is a report—we wrote a report on this project.

Dr. **Meyer**. Would you have somebody shift that blackboard away so the panel can also see the screen.

Mr. **Spano**. What I'm going to show in these slides—and I'm going to speed it up—is results of a test program we ran, comparing the vibration drop that's caused by the rubber joint or neoprene joint as compared to all the other existing systems. It's contained in that report.

Can I have the first slide, please? It's so small, I wonder, could we move that table over there? I think we ought to move the table.

Dr. **Meyer**. We can see it all right, Mr. Spano. Go ahead. Do you have that focused as well as you can get it?

Mr. **Spano**. Now, this is typical cast iron waste pipe everywhere. This is the hub, this fits in, and it used to be a rigid joint with lead oakum. A neoprene gasket now fits in between, and there is no rigid tie between this joint, as that you have a vibration drop. Now, another system was devised that also was very interesting; this is the no-hub system. Now, you will notice that in this, the common system we know today, there's a male part and then there's a hub, and one part through the gasket fits into the hub. Now, that hub is a little extra thick, and it's not desirable that waste pipes touch walls. Because if there's any vibration within a pipe, and it touches a wall which is relatively a limber diaphragm, it will radiate the vibration out as noise and cause noise problems. A system was devised where, instead of having a hub and the male part, a simple coupling is used. This is a stainless steel coupling, and it has a neoprene sleeve inside. And this is simply inserted—assuming a joint is being made—the clamp is then placed over it, a torque wrench is then inserted. Now, this is a loaded torque wrench, so that whenever it starts to snap, you put in a positive torque of—the value I don't remember right now—the unit is permanently sealed and the connection is made. It's done very quickly, and can even be done by the homeowner. And it's a very neat and very good system in the sense that it takes a very small extra diameter at the joint. Now, you'll notice here also—well, in this picture you can't see it—but the neoprene prevents the metal-to-metal contact, and you also get an isolation joint as well as a relatively simple system to use.

Can I have the next slide, please?

This is our series of the materials that were tested.

Can you hear me when I get away from the microphone in back?

Dr. MEYER. Yes, fine. Go ahead.

Mr. SPANO. All right. On top is a plastic pipe system, the second one is copper, this is the compression gasket system, the no-hub, the stainless steel collar, the galvanized steel, and then lead oakum and cast iron. Those are some of the test specimens.

Next, please.

This is simply a diagram of how we introduced vibration into a pipe and how we measured it.

Next, please.

That's just a laboratory setup showing how the testing was done.

Next, please.

That just shows various test rigs.

Next, please.

Now, this shows a standard test group. We decided that we would like to have a bend in the test rig. What we did do, we took a lot of short pieces so that we would have a lot of vibration drop in a relatively short run. Then we wanted to see what happened when the vibration came to an elbow, and then another elbow was laid out the other side. So that we had a variety of test conditions.

Next, please.

Now, this shows some of the results. I think we can go through quickly on these. Plastic specimens—I think it's out of focus. Copper pipe.

Next, please. Well, those are upside down. Why don't you go through the next four and turn them upright? At that point, if you will, just turn everything upside down. I'm way over time; I'm sorry. Well, I think we'll suspend with the slides.

Dr. MEYER. Will you submit those charts for the record?

Mr. SPANO. Yes, I'll be glad to do that. I don't want to take any more of your time.

What we found was that the compression gasket, this system here, gave about 5 dB at a 125 cycles per second, and about 15 dB at about two thousand. We found that this system did not give as much, and as we would expect, because there is less neoprene and greater compression. But it still gave about 3 or 4 dB at a hundred and twenty-five and about 10 dB at each joint. So that these two system in waste pipe will prevent transmission of vibration through the waste pipe system.

We found surprisingly that the plastic systems were very bad in the sense that, if you were to run, say 50 feet of ABS plastic and introduce vibration levels and measure it all the way along at points, that there would be essentially no drop at all in a 50-foot run. We also found copper pipe, which doesn't show up any more because it's too expensive, we found that it also was very poor and would transmit vibration. Galvanized iron is also poor with the rigid coupling joints.

Well, it's all in this report, and I have a limited number of copies, and I'll be happy to leave them on the back table for those who are really interested, because we just have a few copies.

Dr. **MEYER**. Could we have a copy for our record?

Mr. **SPANO**. I think the summary of what we found here—and it's contained in the very beginning—is simply that cast iron with its traditional high mass has always done a good job in keeping the noise from getting through the wall. And now with the vibration joint, or break at each joint, it's a better system than ever. The use of plastic pipe, copper pipe, galvanized or—well, those types are particularly poor systems and have virtually no vibration drop across their joints.

Let me conclude very quickly by saying that EPA could do a tremendous amount of good in dissemination of available information on architectural design on isolation. I think that they could send out simple consumer bulletins that would lead and help the consumer understand. I think that they should act as a clearinghouse for new products that come along that will help build quieter houses, such as this particular product. And it would be a great thing if they had some media through which they could reach the builders of homes, which are the environment builders. If you could reach the builders through some simplified type of do-don't corrective mechanisms, that this would be a great thing, and that it could be put into effect very quickly. And I think that time is a great concern. We've been trying to get corrective action for years, and just the other day—we'll go to another job and we'll say, "Oh, no. Another acoustical jungle." The same dumb mistakes. And it's very, very frustrating. So I have a feeling or a sense of urgency that I would like to convey to the EPA in the dissemination of consumer information and design guides.

Thank you very much.

Dr. **MEYER**. Thank you Mr. Spano. Your suggestions throughout your testimony about the role EPA can play fall on very receptive ears here. I jotted down numerous suggestions and thoughts, and in this regard, I can assure you that we are going to take those suggestions very seriously. In fact, one of my staff who is here with me is deeply involved in public affairs, and another member of our technical staff is concerned with technical publications. We will certainly explore these ideas thoroughly, including how to best get to the consumer, the National Association of Home Builders, and other folks such as that. We do appreciate your presentation.

Now, any questions?

Mr. BERLAND. I noted what I thought was an inconsistency, Mr. Spano. Maybe I misunderstood you. You referred several times to the role EPA could play in terms of providing pamphlets and information to contractors and a guide to consumers. And yet, on the other hand, you said that automobiles never had any safety equipment until standards were set by the Federal Government. I found that inconsistent unless you meant that the EPA would also have to set some requirements in terms of the STC in walls and so forth.

Mr. SPANO. Yes, you're right. From the way you stated it, it did appear inconsistent. I simply want to establish a concept of our society, and that is that in a free, competitive society things tend to get built lower in cost to increase your sales, and you can get to a point where you are making a product that is going to be poorer environmentally and that someone has to draw the line somewhere to say that fans will not create more than so many sones or so many dB, and I was simply saying that I saw EPA as an agency that would establish those minimum standards. I simply used automobiles as a case in fact where the Government did set the standards.

Professor COLE. Somewhat related to that, don't you feel that a great inhibitor to the increased use of these new kinds of joints that you described is not so much—would not be so much the lack of dissemination of information about these kind of things by EPA, but the rigidity of local building codes might prevent this kind of thing.

Mr. SPANO. You hit on a very important point. That's exactly what happened the first time we tried to get this compression gasket system in. Building code people are a great group. Many years ago they started putting fire escapes in, and buildings have a great level of safety today that were built, you know, within the last 10 or 20 years. But they have, in my opinion, tended to become rigid, and where we now need to start coming up with innovative designs for better acoustical privacy, we run across these rigid codes and these rigid thinking building people in these city departments and the like. And the first thing they'll say is, "Well, where is it installed? Where is it working?"

We'll say, "Well, we don't have one, but we can assure you that it's safe and there is no problem."

And they say, "Yes, but we can't take a chance. Show me where it is already in place."

So you get the country's building people saying, "Show me where it's in place somewhere else, and there's no problem."

So we have fallen on this. We plead for a special permit on one building only to install this under close supervision, and we'll give them letters showing our engineering and everything else involved and hope that they'll relent a little bit and live dangerously, as they see it. But there is one place that EPA could be of tremendous help. If a good system is being stopped because the building people say, "Well, I'm not going to try it on my building. I want to be sure it's going to work somewhere else," they are scared. This is the greatest defeat of progress that we need so badly for better privacy. EPA should start to come up with systems, maybe evaluate them, perhaps, research contracts or through some means. And then give it a certain blessing, so that a building official in Tonawanda, N.Y., takes a look at it, he won't be scared to death.

Dr. **Meyer**. Thank you very much, sir. We appreciate your extensive presentation.

I think the Chair will call about a 5-minute recess for sort of a standup break, following which we will hear from Mr. Charles Parrott, who is the director of the redevelopment authority at La Crosse, Wis. He has some very interesting comments to make.

(Whereupon a brief recess was taken.)

Dr. **Meyer**. If you will all take your seats, we'll proceed.

After this brief recess, we'll now proceed to hear from Mr. Charles Parrott. Mr. Parrott is the executive director of the redevelopment authority of La Crosse, Wis., and has had some extensive experience in certain aspects of planning as it relates to noise. We are very happy you could take time to get here, sir.

STATEMENT OF CHARLES D. PARROTT, REDEVELOPMENT AUTHORITY OF LA CROSSE, WIS.

Mr. **Parrott**. Thank you.

Dr. Meyer, distinguished members of the panel, ladies and gentlemen, incorporating increasing provision for protection from sound into the urban planning process is an inevitable action that has a direct impact on the habitability of American cities.

The selected placement of potential major noise producing activities is the initial step necessary to protect the urban dweller and his neighborhood environment. Regulatory measures governing intensity of land use, control limits on sound producing devices, and sound reduction engineering and architectural designs for transportation facilities and certain other forms of land use are required to supplement selective placement. With the systematic application of these controlling factors and the public's understanding of the need for such measures, the mounting threat of sound pollution can be reduced.

The current emphasis on salvaging our natural environment is providing a public awareness of problems some urban planners have had to deal with for many years and, hopefully, providing all planners with an additional incentive to incorporate expanded provisions for environmental protection and restoration in their professional activities.

The urban planner is in a unique position. His activities often are well covered by the news media, and he has an opportunity to help educate the public, in addition to the elected and appointed officials he may be serving. A decade ago the planner could consider it a significant accomplishment if he was able to convince his community to adopt a municipal ordinance which included at least industrial performance standards as a means for providing some measure of environmental protection. Today it is not so uncommon to have performance standards setting maximum limits for various undesired characteristics of urban development, including light, smoke and noise, incorporated into municipal codes with respect to industrial districts and even commercial and residential districts.

The city of Madison, Wis., adopted a code earlier this month setting maximum noise levels for all stationary and moving noise-producing devices in all zoning districts and public ways with the only apparent exceptions being emergency vehicles and fireworks displays. Yet, we have a deficiency, as I see it, in the planning profession because we are unable to get every city to adopt and enforce such criteria, important as it may be to the welfare and safety of existing and future generations.

It appears to many lay citizens that if we are not going to allow an industry to locate in a residential area because of the noise pollution and air pollution which this industry may produce and, thereby, adversely affect residential neighborhoods, transportation planners should not be preparing plans for communities which call for the construction of high-speed freeways and expressways in association with residential land use. Such highways can be expected to produce noise levels to an average of 70 to 75 dB(A) at grade, 350 feet from the center line of the nearest moving lane for at least 50 percent of the time of every 24 hour day on a continuing basis. When this factor is coupled with the air pollution resulting from freeways, the physical removal of thousands of dwelling units, with land acquisition, relocation and construction costs which reach into the tens of millions of dollars or more, in addition to taking millions of dollars of real estate off the tax rolls, it might appear to some people that those engaged in transportation planning are concerned only with the movement of traffic or at least far less concerned with the human and community disruption and environmental destruction resulting from their proposals.

Any freeway network in an urban area may pass through commercial, industrial, residential, agricultural and other types of land use areas. Normal noise levels from freeway sources may be acceptable in an industrial area; these same levels would be less acceptable in a commercial area, and might be considered very unacceptable in a residential area. From the economic standpoint, it is difficult to justify the costs of purchasing additional widths of right-of-way to protect residents from the adverse effects of high-speed freeway facilities at this point in time. With the enactment of Public Law 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, it may well be that because of the increased relocation assistance and payments required under this uniform policy, transportation planning will take a longer, harder look at where freeways are to be placed.

In some cases, the optimum efficiency in traffic movement might now receive not primary emphasis, but equal emphasis with other considerations such as residential and business relocation, right-of-way acquisition costs, environmental disruption involved with construction, and the long-range adverse environmental effects on nearby residents and property values that might be caused by the proposed facility. This condition is becoming apparent in many states and Wisconsin is now feeling the brunt of citizen objection to the placement of high-speed trafficways.

Proposed facilities involving cities stretching all the way from Green Bay to Milwaukee in the eastern part of the State, and the area of La Crosse in the western portion of the State, are being hotly contested by the citizenry, local governments, and those who desire to preserve the remaining natural environment existing in these areas. A recent experience in La Crosse found the general plan adopted by the local governmental agencies. The plan involved a proposed north-south freeway crossing interstate highway 90, then passing through one primary wetland area; then through a major portion of the community itself, displacing some 2,000 people; and from there into the heavily forested Upper Mississippi River National Wildlife Refuge. In the Refuge, among a great many other things, the facility would eliminate several of the most productive spawning beds for game fish in the Upper Mississippi River Valley, and would destroy one or more American Lotus beds, which are a nationally protected wildflower. The redevelopment authority, which is also the city's relocation agency —or central relocation agency—although not a part of the city government itself, challenged the proposed location of this freeway facility from the standpoint of the community's questionable ability to absorb this magnitude of low- and moderate-income residential displacement in any particular length of time, an undefined cost benefit ratio, coupled with the enormous environmental disruption potential that could result from the construction of this facility, and the massive dredging that would be required to make construction possible.

Immediately thereafter the Common Council of the City of La Crosse by resolution called for the State department of transportation to prove its case and supply the local government with environmental evaluations, relocation feasibility analyses, and complete cost analyses comparing the cost factors of all available alternatives and design types of freeway facilities that could be utilized to move traffic through the city in the future. Further, they requested that the Department of Transportation provide written assurances that no corridor hearings would be scheduled until the above studies are completed to the satisfaction of and approved by the Common Council of the City of La Crosse, Wis. These studies are not a normal part of the general plan preparation, but it was made very clear that these studies must now be done to provide information necessary to justify the proposals in the general plan before any further actions are taken that would move the transportation plan closer to implementation.

The potential noise question as it relates to various freeway alternative corridors and design types of freeway facilities was first discussed in La Crosse on July 28, when I made the presentation at the hearing of what could be expected along each of the alternative freeway corridors. There was one corridor which was proposed by the State department of transportation, and two other corridors that were proposed by local professions.

People generally have little or no knowledge of the possible effects that various types of installations can have on their environment until the conditions are experienced, and then it is too late. Therefore, it is important that the planning profession be sufficiently informed on all environmental considerations and take these factors into account in their studies, in their reports, and in their explanations to the public and public officials. Only in this way can the confidence in the planning process be continued as we attempt to solve ever-increasing urban problems.

One action which may help in this regard could be to incorporate specific requirements for social, financial, and environmental evaluation relating to major transportation planning proposals into federally assisted 701 transportation planning programs.

For many years, planners have attempted to regulate land use around major airports and military installations where sound pollution and possible danger from falling aircraft exists on a continuing basis. Because of the magnitude of airport operations, employment and often cheaper area land prices, residential development will occur as close to airport facilities as will be allowed by the communities in which they are located. A combination of possible solutions from the standpoint of noise and safety hazards are apparent.

Land use controls, density controls, public property acquisition, and building code soundproofing requirements for construction in undeveloped areas near freeways and airports can employ limited defensive measures against excessive sound.

The problem near transportation facilities already surrounded by urban development is significantly more complicated. The development is there and any attempt to modify it will result in immediate practical and legal questions. Unless the level of the noise can be limited by controls on the noise producing devices, or in the case of freeways, limited by sound shields, it is doubtful that the noise factor alone can economically justify more severe public actions such as public redevelopment to less intense land uses. As we have learned so many times in the past, preventive measures, however unpopular, are far less costly and difficult than corrective actions.

I was delighted to learn that the effects of noise on wildlife and on humans are being studied in St. Louis and Memphis in cooperation with the Environmental Protection Agency. It is important that this type of information, when available, be distributed to the professional planners so that they might utilize this technical data on a daily basis in their work activities. It is important, also, that the Environmental Protection Agency itself undertake a public educational program to inform the public of the ways that they might be adversely affected by activities that are taking place in the urban and, in some cases, rural areas of the nation. Many planners are becoming increasingly involved in the same questions that your agency is struggling with at this time, and the only way we are going to find better solutions to the problems with which we are confronted is through cooperation, understanding and research.

As the extent of temporary and permanent damage to hearing, sight, the nervous system and other body functions from varying levels and sources of sound become more widely identified and discussed, it is reasonable to expect that a variety of changes in planning concepts will evolve. Many urban sound sources exceed the recommended maximum of 85 decibels, cited by Theodore Berland to be the safe limit that the components of the human body can experience.

In view of the documentation from the Acoustical Society of America that the average community sound levels are increasing at a rate of 1 decibel per year, we can no longer afford to treat noise as a minor urban problem.

If the 85-decibel level is reached by 1979 as projected, we have less than 8 years to develop effective protective measures and enact meaningful controls.

Our profession is aware that requirements for moving traffic and aircraft will be greater in 1990 and the year 2000 than they are today; but, also, we must acknowledge that the requirements for preserving our environment will be much greater than they are now. Somewhere we must turn the corner and make planning for the integrity of our natural environmental resources and the people they serve and protect as commonplace as the planning for residential, industrial, and commercial areas, and transportation facilities.

We must have adequate traffic circulation. We must have airports. We must have adequate housing, and we must take those responsible, necessary actions to see to it that the people in the communities which we are planning are protected from the adverse environmental effects which so often result from implementation of plans we have prepared.

I don't believe in the view that a modern society means people versus environment. I am confident that the planning profession can fit its activities into the environment without destroying it, but it will challenge our sensitivity, intelligence, and resourcefulness.

Thank you.

Dr. **Meyer**. Mr. Parrott, I certainly agree with the thesis that you have enunciated at the conclusion of your statement. And I also appreciate the challenge that you and some of the previous witnesses have given to the Agency with regard to our role of leadership and providing more information. Please be assured that the staff and myself are going to take that into account as we review the results of this hearing.

Panel?

Professor **Cole**. Mr. Parrott, is that common council—is that the city council?

Mr. **Parrott**. Yes. In Wisconsin, they are referred to as the common council.

Dr. **Meyer**. Panel?

Dr. **Ward**. What's this documentation, the Acoustical Society says everything is going up 1 dB (A) a year? I've heard this bandied about many times and as far as I know, it was originated by Nugent, who, of course, is a member of the Acoustical Society. But I don't think—I don't believe it, in the first place, because it means doubling the sound energy every 3 years, and it seems a little extreme. I don't think we should blame the Acoustical Society for that statement.

Mr. **Parrott**. I don't think it's a detrimental statement from the standpoint of——

Dr. **Newman**. If it's not so, it's improper.

Mr. **Parrott**. Mr. Berland, do you have any remarks regarding that particular statement?

Mr. **Berland**. Well, in terms of it not doubling every 2 or 3 years, I think you could say it isn't.

Dr. **Meyer**. If all the gentlemen will yield for a minute, the chairman will say that we have heard this testimony before from other people using Verne Nugent's figures, which he gave in a speech. In fact, we had to go really and track down the speech. I don't know what the figures are, but one of the things we are trying to do as part of the report to Congress that we're working on, is, through a couple of our supporting contracts, going back and finding some municipal surveys on noise that were done several years ago, some of them going back 10 or 15 years ago. We're trying to replicate those now to get some measure of the differences in the acoustical environment covered by those surveys. I'm not sure what we're going to find when we get through with it or how meaningful it will be. I think all of us will agree—and Dixon, you can disagree because you are entitled to disagree—but all of us would generally concede that there is an increase in acoustical energy across man's environment in the United States, going up at an accelerated rate over the last several years, and is a matter of real concern.

Does that seem to be a fair statement?

Dr. **Ward**. Oh, yes.

Dr. **MEYER**. All right.

Dr. **WARD**. But one dB a year is too much.

Dr. **MEYER**. Well, we won't argue the details, but I believe we do agree on that.

Any other questions, panel?

Mr. **BERLAND**. Just one thing here. Maybe it's really more of a comment—or two comments. First of all, I'm very happy to hear that planners such as yourself are including environmental protection in your planning. I think the fact that they are is commendable. On the other hand, it seems sort of remarkable that you had to go to all this trouble because there are so many sources of noise. One would think that another way to solve the problem is to attack the place of noise. But we are going to hear more about that later. I felt I had to make that comment.

Dr. **MEYER**. Thank you, Ted.

I certainly appreciate your coming, Sir. And as I said, I will accept the challenge that you and others are laying down. We are going to be making some plans on how to get this through to the institutional process, to the institutes of planners and architects and others, and the more general process. Thank you for a very fine presentation.

Now I'd like to ask Mr. Bailus Walker, Jr., the Deputy Health Commissioner for Environmental Health for the city of Cleveland to come forward. We are very happy to have you here, Sir, and look forward to hearing your statement.

STATEMENT OF BAILUS WALKER, JR., HEALTH COMMISSION, CITY OF CLEVELAND

Mr. **WALKER** Mr. Chairman, members of the panel, on behalf of Mayor Carl Stokes and the people of Cleveland, I am pleased to have this opportunity to express our concern about noise pollution as it relates to the health and welfare of our community.

I think we in Cleveland, recognize that noise pollution has not reached the crisis stage of other contacts of the physical environment such as air, water and solid waste, and we have no evidence in Cleveland to support findings elsewhere which suggest that rats under prolonged exposure to noise have turned homosexual, nor are there indications that all Clevelanders will be stone deaf by the year 2000 as some "well-informed" scientists have predicted.

But, the people in our community do sense the noise as a growing nuisance which spans the entire spectrum of community life, from home, to work, to school, or recreational activities, and they fully agree that something should be done about it.

I think the fact that the Environmental Protection Agency is conducting these hearings this week would indicate that something can be done, and we applaud this initial effort.

Since our concern today is urban planning, architectural design and noise in the home, allow me to comment on these areas from the vantage of a local environmental administrator whose area of responsibility spans from insect and rat control to housing hygiene and radiological health.

The problem of indoor noise did not emerge suddenly in Cleveland or any other urban center, but it developed over the years with progress in industrialization and mechanization of our society.

The older dwellings, by virute of their more massive construction, larger rooms, numerous doors, hand operated appliances and heavy sound absorbent furnishings, were comparatively quiet places in which to live.

In contrast, the modern dwelling with its light-weight construction, open plan design and multitudes of noisemakers, provides very little protection from noise generated within or intruding from the outside.

The Cleveland Department of Public Health recently surveyed a cross section of our community to determine the extent of local concern about noise.

Data from the survey of some one thousand residents indicate that 80 percent were disturbed by noise outside the building and 16 percent by noise from adjoining apartments.

Of those interviewed, only 1 percent were not disturbed by noise in their own home. Interestingly, these findings are in close agreement with similar studies in London.

Major property management firms report that noise transmission is one of the most serious problems facing managers and owners of apartment buildings. They readily admit that market resistance is not only increasing as a result of excessive noise transmission, but that lack of acoustical privacy and noise control are among the greatest objections to apartment living. Similar concern is expressed by owners of hotels, motels and office buildings which lack adequate insulation and noise control.

The fundamental causes of the noise problems of buildings in my community are the same as they are in other cities: poor workmanship, poor acoustical design, lack of mandatory acoustical criteria and enforcement, higher cost of sound insulated construction.

These have been discussed in some detail in several publications, both governmental and nongovernmental, and will not be elaborated upon here.

Although the building industry is to be complimented for some of its achievements, the facts remain that conventional building techniques have produced some of the noisiest buildings in existence. As a consequence, there is a strong and increasing demand for noise control in residential housing, particularly in multiple dwellings.

But, part of the problem lies in the fact that designers and builders of houses and offices are not sufficiently aware of noise control.

Strangely enough, much of the interior noise can be readily prevented without undue cost by the simple use of basic principles which govern the generation and transmission of noise. It requires no great prescience to recognize that appliances that go into residential buildings can usually be modified to provide a quieter household convenience. But dishwashers, air-conditioning units, garbage grinders and commodes still generate a significant noise level, which may impair hearing if the exposure were eight hours daily for the usual work week.

Another concern of Cleveland residents is the traffic noises, especially those radiating from the freeways and expressways.

Of all the types of vehicles traveling Cleveland expressways, the trailer truck is perhaps the unit which prompts more citizen complaints to our office. In fact, it is probably the most notorious noise producer.

At expressway speeds a single truck may generate more than 100 decibels, while a long line of traffic, which is fairly common in our community, may produce noise levels in excess of 150 decibels.

This usually occurs late at night when the ambient noise is at a minimum and thus the noise appears to be much louder and more disturbing to the residential environment.

It is extremely unfortunate that highway engineers and city planners have given little consideration to the effects of traffic noise on a community.

When asked to explain the routing of highways through quiet residential neighborhoods, some planners and engineers resort to the old cliche we heard years ago about air pollution: "It's the price we must pay for progress."

While current criteria, including socioeconomic factors and land acquisition costs, are valid considerations in locating highways and expressways, the health and well-being of the community, value depreciation of property along noisy expressways, and the high cost of sound proofing homes, schools, churches, hospitals and other facilities should, at the outset, be weighed carefully in the routing of surface transportation.

Some effort has been made to reduce the noise levels within passenger automobiles, but there is a need for more emphasis on the suppression of noise radiated by trailer trucks. The action should extend beyond recent improvements in muffler design and tire tread design.

Since these are "local problems," it may justifiably be asked what local activities are underway to remove or reduce these disturbances?

As for legal tools, the Cleveland Penal Code contains a section prohibiting "unnecessary noise." It states:

> It shall be unlawful for any person to make, continue or cause to be made within the City of Cleveland any reasonably loud, disturbing and unnecessary noise. . . .

This is followed by a listing of acts which are declared to be disturbing and unnecessary noises.

The penalty is not to exceed a $50 fine or 30 days in the Cleveland workhouse.

As you might suspect, this ordinance is extremely difficult to enforce and it has been largely ineffective because of economic, social, and political considerations and the problems with detection or proof of violation.

Passed in 1941, the Cleveland ordinance, like many other local antinoise ordinances is weakly phrased and open to ambiguous interpretation and deals with a limited number of common noise violations but overlooks control of major noise producers.

Indeed it is another example of the wide variation among local noise control ordinances, which range from being overly restrictive and impractical to ineffectual.

While this ordinance was probably developed without expertise or accepted techniques of measurement, evaluation and rating of noise, it does represent a sincere effort by local officials at that time to denounce noise and minimize its intrusion in populated areas of the community.

With an equal degree of concern, suburban communities near airports have passed stringest laws governing the decibel levels permitted for airplanes flying over their boundaries. These, too, are difficult to enforce unless a town employs its own pursuit plane force. And airlines complain, and justifiably so, that it is unreasonable to expect them to conform to dozens of widely differing local ordinances.

From a practical standpoint I have serious doubt that criminal prosecution under a nuisance type ordinance will ever serve as a deterrent to the ever-mounting volume of urban noise.

Private suits at common law have also been suggested as an approach to noise abatement. Our experience would indicate that this is not sufficient since suits are fortuitously brought and damages great enough to warrant an injunction are often difficult to prove.

And finally, zoning ordinances are of limited value in controlling urban noise, as they simply aggregate smiliar land-use activities, as residential, commercial, and industrial and tend to ignore peripheral areas and factors such as transportation.

It seems, then, that we have reasonable grounds on which to question the adequacy of local government, left to its own resources, to control urban noise effectively.

In fact, the alleviation of the noise problem frequently requires action that transcends political boundaries and thus a broad based, coordinated attack on the problem must involve the Federal and State levels of Government.

It is practical and highly desirable to establish Federal standards for some items moving in interstate commerce to eliminate noise producing features at the point of origin or at the point of manufacture rather than expect local control once the equipment is operating in a community.

The critical areas of continuing research, manpower training and development criteria, demonstrations and funds for local surveillance and monitoring certainly require the full and effective leadership of the Federal Government. This contention is reinforced by a review of the current financial constraints of State and local governments and educational institutions.

In summary, there are shortcomings in our present knowledge and programs for noise control, and if we are to minimize additional environmental stresses on community living, a coordinated attack on the problem must be developed now.

It is essential that we develop nationally accepted techniques for the measurement, evaluation, and rating of noise and its effect on human health, and to accomplish this will require scientific talent, trained technicians, and additional facilities and financial resources at all levels of government.

We should hope that these hearings will ultimately result in these necessary inputs.

Mr. Chairman and members of the panel, thank you for the opportunity to offer these observations.

Dr. **MEYER**. Thank you very much, particularly for some of the points you have raised with regard to legislation and needed research. I'll comment on that when the other panelists have their questions, and I'm quite sure there is at least one.

Dr. **GLORIG**. On page 4, did you really mean 150 decibels? Maybe it's 115, maybe misheard by the typist.

Mr. **WALKER**. No; we didn't mean 150.

Dr. **MEYER**. No; that's a typographical error. A hundred and fifty would be pretty rough.

Mr. **WALKER**. Right. I'll apologize for that.

Dr. **MEYER**. Any other comments?

Dr. **WARD**. I was a little surprised here as I read this, if this is also—maybe it doesn't belong here. It says, "Of those interviewed only 1 percent were not disturbed by noise in their own home." Does that mean that 99 percent of the people were disturbed by noise in their own home?

Mr. **WALKER**. That is correct.

Dr. **WARD**. And yet, only 16 percent—well, only 8 percent were disturbed by noise outside the building? That seems strange to me.

Mr. **WALKER**. Dr. Ward, those surveys were conducted by some of our friends at the University of Minnesota.

Dr. **WARD**. I couldn't care less. It doesn't seem reasonable because usually people are less disturbed by the noises they generate themselves than by those that come from outside. That's why it seems strange.

Dr. **GLORIG**. Are you sure that "not" isn't a typographical error?

Dr. **WARD**. Is this report published?

Mr. **WALKER**. No; it's not published.

Dr. **MEYER**. Would you accept that it's possible and certainly there's no criticism meant—it's entirely possible that that's been transposed? I'm willing to believe anything these days, substantiated by the appropriate evidence. And under certain circumstances, I know that what one thinks is the absolute truth, based on their own frame of reference may prove false; somebody goes and does a study some place else, and this proves that people all across the Nation aren't necessarily reacting always the same.

Mr. **WALKER.** One of the enterprising reporters for the Cleveland Press did his own survey and came up with similar findings. I'd like to enter that in the record.

Dr. **MEYER.** Are there any other questions? Because this is a forthright statement of municipal approach to the problem.

Mr. **BERLAND.** Amen.

Dr. **GLORIG.** I'd certainly like to compliment the group there for their attitude toward the whole problem. It's the first real shining light we've seen so far.

Dr. **MEYER.** The thing that's very interesting to me is the recognition—not that I'm a Federal bureaucrat trying to build a Federal bureaucracy—but you highlight some of the real problems that exist in coming to grips with this problem in an effective way. It was brought out as an example, that Chicago, one of your neighboring communities, in setting some standards, community lines, city property lines, administrative and judicial jurisdiction lines, found that it was entirely possible for an individual, say, running a lawnmower in his front lawn in compliance with the law in another political subdivision, to be in violation of a law in Chicago, the subdivision right across the street. Also, with due deference to the problems associated with aircraft, the fact was noted that he might be arrested and be fined for running an automobile that violated the Chicago ordinance, while at the same time an airplane flies overhead and drowns him out. So that we do have to recognize, as you have done here, and call our attention again, to the need for getting to grips with this in some sort of cohesive manner.

Professor **COLE.** Mr. Walker, did you mean to imply in your statement that efforts by local governments and local communities to improve their capacity to control noise pollution in their own areas should be downgraded or abandoned in lieu of a more State or federally oriented approach? Or are you suggesting a mix, with the heavy priority on the Federal and State side? Or could you elaborate on that?

Mr. **WALKER.** No; I did not intend to convey the impression that we downgrade local control. I think there is a limit as to what we can do locally. I think this is borne out by our experience in air and water pollution. I feel that we need a substantial Federal input, as we have had in air and water pollution, if we are going to surmount this mounting problem.

Dr. **MEYER.** We at the Federal level certainly believe in a mix, with the Federal Government doing those things which it ought to do, and ought to do well, but with the major burden of responsibility still being vested in the State and city. Thank you very much, Sir.

Mr. **WALKER.** Thank you.

Dr. **MEYER.** The next witness who I should like to have come forward is Mr. Robert Wegner, who is the director of regional planning with the North Central Texas Council of Governments, and also a member of the American Institute of Planners. I'm sure that in view of some of the comments about airports and aircraft, that you'll have some words to say in this regard.

STATEMENT OF ROBERT L. WEGNER, SR., NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

Mr. WEGNER. Thank you, Dr. Meyer. In the interest of the patience of the audience, I am going to skip some of the introductory remarks.

Dr. MEYER. Fine. We'll include your entire statement in the record.

Mr. WEGNER. I'm speaking as an individual professional planner, and I hope that the remarks I make about the North Central Texas Council of Governments, for which I am the director of regional planning, are primarily matters of fact, so I will be reporting about those.

This organization, the North Central Texas Council of Governments' specific interests in the subject of these hearings began in September 1968, when its executive board gave high priority to the regional airport environs study. This study was designed to help local governments deal effectively with the challenges and opportunities posed by the new Dallas/Fort Worth Regional Airport, which was then in the planning stage and which is now under construction, with operations scheduled to begin in 1973. This new airport, a joint venture by the cities of Dallas and Fort Worth, is, in many respects, an airport of superlatives. Covering over 16,500 acres, it is by far one of the largest airports under construction in the world today.

I might add parenthetically that there are other larger ones in the planning stage; Montreal, for example.

It is designed in ultimate capacity to accommodate 300 aircraft movements per peak hour, which is equal to one instrument landing or take off every 12 seconds, which exceeds the present capacities of all three airports serving the New York City region.

Among the key immediate challenges to which the regional airport environs study addressed itself was the matter of the impact of aircraft sound on the development of surrounding land. An aircraft sound exposure map was prepared by NCTCOG—which is a short acronym for the North Central Texas Council of Governments—with the assistance of the Federal Aviation Administration. A brief, simple explanation of the significance of the three sound zones depicted on that map was prepared for use by local officials concerned with land development in the areas immediately adjacent to the regional airport site. A copy of this explanation and a small-scale facsimile of the larger aircraft-generated sound exposure map is attached to the copy of this testimony for entry into the record.

Because of the technical nature of this subject, three seminars were held during the summer of 1969 for planners, administrators and other technical personnel of cities—I'd like to note here principally building inspectors—of the cities directly affected by aircraft sound exposure and/or by height or flight obstruction regulations. These cities included Arlington, Coppell, Euless, Flower Mound, Fort Worth, Grand Prairie, Grapevine, Irving, and Southlake. Through these seminars technical representatives of each of these cities were given technical facts and guidance, including the map of aircraft sound exposure, a listing of recommended land uses related thereto, and general technical information about acoustical treatment for buildings. In September of that year a similar seminar was held for representatives of the eight independent school districts in the immediate impact area of the airport. These representatives were provided with information similar to that given the city representatives, but with emphasis on school location and construction.

All of this work was accomplished, incidentally, with financial assistance from the Department of Housing and Urban Development, under what is called a "701" urban planning grant. It was accomplished with active cooperation from the Federal Aviation Administration, the Regional Airport Board and its staff, the Department of Housing and Urban Development, several interested State agencies and the affected cities.

I'd like to add here—inject again—that these groups were represented on the two advisory committees, one a policy development advisory committee, the other a technical advisory committee.

NCTCOG's second major effort to deal with the impact of aircraft generated sound from the new regional airport was performed in cooperation with the city of Irving. I believe you have already heard a report yesterday from Mr. Joiner about part of this. This was done under a special project funded by the Department of Housing and Urban Development, entitled the "Cooperative Program of Planning for Airport Impact." This project was designed to help the cities most directly affected by the new regional airport to carry on local planning in response to airport impact. Irving—the city of Irving—chose to develop an airport zoning ordinance and soundproofing modifications to its building code. I am furnishing you, if you don't already have one, with a copy of this particular study prepared by Joiner-Pelton-Rose, Inc., of Dallas, Tex., consultants in acoustics.

Dr. **Meyer**. We don't, and I'd like to have that for the record, sir.

Mr. **Wegner**. All right. I have also appended to my remarks here a copy of the brief summary from this report that I would like to quote at this time.

The construction of the Dallas-Fort Worth Regional Airport in a relatively undeveloped area has given the surrounding communities the opportunity to plan the land development with the airport in mind. To obtain maximum utilization of the land, prohibitive zoning of the land should be used together with soundproofing of the buildings to allow a larger variety of activities to be compatible with the sound exposure that will exist.

Normal land use activities are classified into four groups with different sound exposure sensitivities. The first group given here in the table is insensitive. The typical activities are industry and warehousing, and the maximum indoor composite noise rating is 95.

The moderately sensitive group contains retail and offices, with a maximum indoor CNR of 85.

The sensitive group, typical activity being residential, has an indoor CNR of 80.

And the very sensitive group, typified by hospitals and schools, has an indoor CNR maximum of 70.

The city is divided into zones, by sound exposure, which controls the type of activity that may locate there. Activities may be allowed in the next two higher noise zones when the building is soundproofed.

The soundproofing modifications will not be required of all construction in the high noise areas. Nor will it be required of noise-sensitive activities, such as hospitals and schools, throughout the city. It will only be required where needed.

The soundproofing modifications require that:

1. Exterior walls and roofs be masonry or underlaid with gypsum sheathing.
2. The lowest floor must be slab on fill or below grade.
3. Additional resilient ceilings are required in sleeping areas.
4. Mechanical ventilation must be provided to maintain a satisfactory environment with all doors and windows closed.
5. Openings in the wall or roof over 4 inches in diameter must be connected to the interior by metal ducts lined with sound-absorbing material.
6. Single glazed openings must be nine thirty-seconds of an inch sound-retardant glass.
7. Double glazed openings must use double strength glass spaced 2 inches apart, and
8. Exterior doors must be hollow metal.

These provisions will add from 2 to 10 percent to the cost of a building, depending on its type and size.

To create a soundproofing building code that could easily be understood and enforced by nonacoustical personnel, with a minimum of training, a material type code was chosen. This requires that the code be periodically updated to allow contractors to use the most economical materials as they become available. As there are many ways to soundproof a building, exception to these particular specified methods should be allowed if the owner or contractor can prove to the city's satisfaction that the intent of the code is being met by other techniques.

Height restrictions have been determined for the major runways, and these have been indicated on a map of the city.

That's the end of the appended sheet from the Joiner-Pelton-Rose report.

NCTCOG is now engaged in another HUD-assisted special project, which we call simply the Cooperative Planning program, in which we are preparing a number of model codes and ordinances and guidelines for local governments to use in improving their local planning capability. Among these is one study directed to the problems of land development in the airport environs, in which we will attempt to spell out in more detail guidance regarding the types of land use which are most compatible with different levels of aircraft-generated sound. When this study has been completed, we will be pleased to provide the Office of Noise Abatement and Control with copies of this report.

Dr. **MEYER**. Would you please do so.

Mr. **WEGNER**. With possibly few exceptions, my remarks so far have been limited to matters of fact. Now, as a member of the American Institute of Planners, I would like to express my personal and professional opinion in response to the objectives of these hearings as set forth in the "Plan for National Hearings on Noise Abatement and Control." Both preventive and remedial measures to control, reduce and/or eliminate the harmful effects of noise is and properly should be the concern of all professional planners and all official planning agents—public planning agencies, if you will—involved in maintaining and improving environmental quality. Planners, by nature of their profession, and by virtue of their concern with the environment, and planning agencies, by virtue of their authority under law, are in the best position, I believe, to develop proposals for preventive measures by anticipating possible adverse effects from noise and by developing proposals to avoid or minimize these adverse effects. They are also in a position to analyze problems and recommend solutions which would remedy existing noise-harmful situations. In addition, in the State of Texas, which is recognized to have an excellent communications system between State and local government, via the Governor's office and through the regional councils, such as NCTCOG, a network already exists for providing effective communications on noise problems and noise control requirements, as well as for eliciting further information about interests in and current efforts dealing with the noise problem. In this regard, I would suggest that you contact Mr. Dan S. Petty, Director, Division of Planning Coordination, Office of the Governor, in Austin, Tex. I'm quite sure that Dr. Cole, being very familiar, could help you further with this.

Dr. **MEYER**. We'll do that.

Mr. **WEGNER**. To plan preventive and remedial measures noted, professional planners and planning agencies require legal authority, political sanction, technical guidance and assistance, and financial assistance. I venture to say that most planning agencies possess broad enough powers to enable them to undertake noise-related studies and plan preparations.

The other three ingredients, however, may frequently be lacking. Accordingly, I would like to see incorporated in the Noise Control Act of 1971, Senate bill 1016, or similar legislation, provision made for technical training and assistance, as well as financial assistance, and incentives for noise control and abatement planning at State, regional, and local levels as an integral part of the environmental protective activities at each of these levels. Approximately $6 million per year—I want to stress this, "per year." Not one time or not for a few years, but per year—would provide an average of $25,000 to each of the 240-odd standard metropolitan statistical areas in the United States. Assured funding of this type, matched by a nominal amount of State and local funds, would establish a sound foundation and a substantial start toward deliberate, continuing environmental protection activity at the regional level, which is only haphazardly supported today.

I'm adding to my comments here by adding this: We do not need, and cannot afford—I'm talking about regional planning—We do not need and cannot now afford full time permanent staff specialists in noise control. We do need environmental protection generalists schooled in several aspects of environmental protection, including noise, who can communicate with the technical experts on the one hand, and with the planners, public administrators and officials on the other, not to mention the lay public at large.

Thank you for the opportunity to present these facts and my views. I'd like to say that Dr. Cole mentioned that I might respond to the remarks by Mr. Burdis. I believe I'd prefer if you would give me a specific question to respond to.

Dr. MEYER. Professor Cole?

Professor COLE. When did I say that?

Dr. MEYER. Well, earlier you said something about you wanted one of the planners to make some comment about his—Burdis' concept of the air corridor and integrated approach to planning, three dimensional planning.

Professor COLE. Well, I think your comments have talked in and around those ideas.

Mr. WEGNER. I will be more direct and say this: Specific suggestions about including, or making the requirement that the airway traffic lanes, or whatever you might call them, be depicted on all subdivision plats and all maps for planning to me is an excellent idea. I think part of the function of the plan is to put the public and public officials on notice as to what is the situation that exists today. And if that's part of the situation that exists, it should be depicted on that plan map. And it should also be included on the official legal filed plat, recorded plat, so that individual property owners themselves are warned and apprised in advance of what the situation might be.

Dr. GLORIG. I notice in the report from Joiner that you used, the composite noise rating system, you have some numbers in there. Do you know the source of those numbers, or is someone from Joiner here that can tell us?

Mr. WEGNER. Well, I'm sorry that I cannot tell you, sir.

Dr. MEYER. I'd appreciate it if you could find that out for us. It's not clear whether these are based on International Standards Organization's recommended standards for community noise exposures, or what. It would be useful to know whose CNR we are using. In fact, part of your testimony indicates a need for the Federal Government getting more research and standardizing the needs of specification of a noise environment. This is an area we are deeply concerned about because there are so many different ways of approaching the problem.

Dr. **Glorig.** In your planning, have you provided for enforcement of these zonings that you are talking about with respect to breakovers? I know Los Angeles had a similar plan, and then the land became available for residential areas, and they went through all that trouble, and they're having the same trouble at Palmdale right now with the new, large airport. They are trying to zone it for light industry and so on, but the real estate agents and communities are putting a lot of pressure on them to sell it for residential areas. Are you having the same problem here? If you are, how are you going to prevent it?

Mr. **Wegner.** Yes, I'd say that I might go back to the part of my remarks which I did not read here. I want to point out that the Council of Governments, like most if not all regional councils, is limited in its capabilities. It's a powerless authority. It's limited to making plans and recommendations and to rendering advice and technical services to its member governments. This is one aspect of home rule mentioned earlier today which allows the decisions of this type to be made at the local level, and at present all we can do is to bring matters to the people's attention and to make recommendations to them. Now, we have one opportunity where we can comment a little more forcefully, and that is in the so-called D–95 process, which requires review of some several 96 different programs in the Federal Government in which aid is granted to local or State entities for construction and acquire property and so forth. And if any of these involved matters have an environmental impact, then we may comment on them. And even though we only comment on them, these comments are considered rather seriously, I understand, by the Federal funding agency; so that is the extent of our capability to influence action.

Dr. **Meyer.** Panel, on my left, any questions or comment?

Dr. **Westman.** Well, Mr. Wegner, I'm most impressed by the process that has gone in the planning for the new airport facility here and would like very much to support your recommendation at the end that there be Federal funding to carry out and implement regional planning and to get people talking together, and I'd like to call attention to what may seem to be detail; I'm curious as to what lies behind this. We heard about the need for consumer education, and we've heard from Mr. Spano very clearly about the need for professional education. We've got to help people learn how to put in the right joint and things of that nature. And the third thing that you have called attention to here is to build a communication network, and you are fortunate in Texas here in having such a network spanning the various governmental levels. Now, on page 3, you refer to three seminars that were held during the summer of 1969. And these seminars were attended, I gather, by planners, administrators and other technical personnel of the cities involved. Do you think that these seminar experiences would be another vehicle for implementing the things that we would like to carry out from the point of noise abatement? Do you think that these seminars were critical points in the process of getting the planning done? Was the interaction that occurred there—well, let me turn it around the other way. If these three seminars had not been held, would the planning process have slowed down or gone less smoothly?

Mr. **WEGNER**. Yes, if these seminars had not been held, the planning process, I think, would have been very, very ineffective and very inadequate. I must add one other facet to this. Besides the technical nature of the subject, the legal implications of the subject made it almost mandatory that we have these seminars.

Dr. **GLORIG**. I don't know why Dr. Westman is surprised. What did you expect from America's number one city?

Mr. **BERLAND**. I think at one end of the spectrum you have the problem—and I don't know the answer to it—who wanted the airport? Was it the local communities that felt the need for the airport?

Mr. **WEGNER**. This is a very interesting story by itself. And I say this not very facetiously, because if any of you had a chance to read the study that was made on it—and there are some more studies being made on it, of course, by special aviation study groups—but I'd say that it came about through the efforts of the CAB, the Civil Aeronautics Board, who determined—I'm just giving a general, simplified version of it—that it would be not possible, and not be feasible, to expand Love Field to take care of projected traffic. And therefore, a new site, a new facility, either in addition to Love Field or in place of Love Field, would be desirable. This was in about the middle 1960's, 1964, I believe, when the order was first issued. As a matter of interest, the response to this was rather rabid in terms of public action. And Dallas and Fort Worth, which had long been renowned for being competitors, got together and did enter this joint venture, and they now have something underway, and it's going to be in operation in 2 or 3 years.

Mr. **BERLAND**. Now, at the other end, there is no requirement, as you point out, that either Fort Worth or Dallas, or the intervening communities respect any of these zoning or other recommendations you have made.

Mr. **WEGNER**. Well, no. Our recommendations are purely advisory. We don't have any means to compel or to bring force. This is by design, to preserve home rule.

Mr. **BERLAND**. There is a gap in my understanding, because there are other communities involved besides Dallas and Fort Worth.

Mr. **WEGNER**. That's right. There are at least ten others. What we have is a case of fragmentation. We have one body, the airport board, responsible for developing the airport site and all that happens there. And then we have a number of other bodies, corporate entities, responsible for reacting and feeding in and so forth. But all we have is our voluntary association, NCTCOG, to help bring about some kind of accommodation among these different interests. But there are also one to one representatives to the airport board in this city and the airport board in that city, so there are several arrangements or relationships that are in being right now.

Dr. **MEYER**. Ted, would you yield a minute?

Mr. **BERLAND**. Yes.

Dr. **MEYER**. I just want to get this clarified. First, the airport board is a State authorized entity; is that correct?

Mr. **WEGNER**. I don't know that there was a specific State law. It is a lawful body; I'll say this.

Dr. **MEYER**. I mean, I'm trying to see where its authority is derived from.

Mr. **WEGNER**. It is more popularly defined as a contract or agreement between the cities of Dallas and Forth Worth.

Dr. **MEYER**. Under their powers derived under the Texas State Constitution?

Mr. **WEGNER**. Yes.

Dr. **MEYER**. Is it a member of the North Central Texas Council of Governments?

Mr. **WEGNER**. It is not a member, but both cities are. And so both cities constitute that body.

Dr. **MEYER**. Ted, any other questions?

Mr. **BERLAND**. I have a lot of questions on the whole thing. But in terms of environment, it also seems to me, Mr. Chairman, that perhaps one of the pursuits of your office would be to somehow get cooperation between EPA and CAB and FAA and all the other organizations, particularly involved in aviation as well as other transportation, because we keep hearing this testimony and it keeps coming up all the time.

Dr. **MEYER**. Well, this is one of the chores that the President's bill now pending in Congress would assign to the administrator of the EPA, that is, that he coordinate all Federal activities related to noise. In addition, even under our existing authority, we do have some channels of communication and coordination to exercise, which we are beginning to do at the present time. So the point is well made; we do have to accept that responsibility.

Any other comments, panel?

Mr. **WEGNER**. Yes, sir. I'd like to append one other remark. If you're interested in pursuing the question of the seminars further, you might make inquiries of Mr. Norman Graff, whom you will be hearing from, I believe, in November in Washington. He was the instructor at the seminars. He helped us, as a consultant, structure this program.

Dr. **MEYER**. One last thing: Your recommendation at the end, of course, is very interesting, and I'm pleased to note that you were not just homing in on noise, but on the entire environmental situation. And I also noticed that, as a good planner, you costed it out with what it would take. But quite seriously, that comment shall be referred to the appropriate people in Washington in our Agency to take a look at.

Thank you very much, sir.

At this point, we're almost back on schedule, and I will recess this hearing to reconvene—and I'm saying promptly—at 1:15. And I hope all of you will come back to hear from the people who put noise into the home, as well as several other people associated with planning. We'll have our landscape architects at that time.

Thank you very much.

AFTERNOON SESSION

Dr. MEYER. Ladies and gentlemen, I call to order the afternoon and final session of this hearing on noise.

Without further ado then, I'd like to ask Mr. Gene Schrickel of the American Society of Landscape Architects, who has been most considerate, if he would give us his testimony. I thank you, sir, for understanding the problems of the late hour.

Mr. SCHRICKEL. I do.

STATEMENT OF GENE SCHRICKEL, AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS

Mr. SCHRICKEL. Mr. Chairman, I'm kind of like the person putting on cosmetics, as a landscape architect. I was kind of hoping I'd be No. 6 or No. 7 before lunch so I could illustrate a point.

But I am a landscape architect and I am here today representing the American Society of Landscape Architects to delineate our views related to noise control through appropriate land use planning.

It has been suggested by many authors on this subject that land use planning is the most effective tool in controlling or separating activities which produce excessive noise. We endorse this view and are hopeful that land use policy legislation currently before Congress will result in proper land use for areas that require unique considerations, such as excessive noise. Once these areas are determined, we are hopeful that compatible uses can be defined wherever possible. Recognition of the limitations of this concept leads to the problem solving at a later stage of development.

While the professional landscape architect is concerned with all aspects of land use planning—from that noted above to physical site design—we feel uniquely qualified to discuss design elements used in site design that affect noise reduction such as earth forms, paving, walls, sculpture, water elements and plant materials. Our concern with the latter has led to our expressed interest in publishing information on the subject.

A year ago, the American Society of Landscape Architects Foundation received a grant to publish a document related to the functional uses of plant materials. Developed in cooperation with the National Park Service, this document is scheduled to be released this fall through the U.S. Government Printing Office. It is an attempt to bring together all of the fragments of information on functional uses of plant materials of which noise control is, of course, a primary part.

Virtually all elements of a design affect noise and the meaningful placement of these elements and an understanding of how they affect noise will have greater importance as pressures increase on our patterns of land use. Like we were talking about this morning on the airport land use, the peripheral use of land around a major airport. This effort to pull together information on the subject has provided only the most basic information especially related to the problems of noise. If we are to utilize landscape elements to alleviate such problems as noise, we must encourage broadscale research to better understand the functional properties of these elements and equip today's designers with the tools that will enable them to properly design specifically for functional considerations.

As we see it, the problem up to now has been the failure to recognize some of today's environmental considerations as a functional need. The elements comprising site design are normally the first to be cut when financial limitations are imposed. The technical aspects of reducing noise are fairly well known and documented. Attenuation of noise by distance and by air and ground absorption, deflection, reflection, defraction and masking enables us to design with some intent of noise reduction.

Where plant materials are concerned, we know less than we would like to. We have been derelict in this particular facet. Studies, however, have shown that plant materials for the most part have certain sound absorptive properties. Plants, when used with landforms, have materially increased effectiveness in controlling unwanted sound. They are more effective, however, as noise scatterers at both high and low frequencies. Studies have also shown that while plants are somewhat effective as acoustical screening elements, they are most effective at frequencies critical to the well-being of man. We know, to, that ground covers and grasses, in particular, have very high absorptive qualities. Beyond this, criteria have been for the most part nonexistent. Through the American Society of Landscape Architects Foundation we are encouraging further research that will substantiate the limited information we have compiled to date.

Incidentally, we are a small national organization, perhaps 5,000 strong. And through the history of the development of the United States, I would say probably an embryonic organization, even though we have celebrated our hundredth anniversary of concerned landscape architecture in 1964.

This knowledge is a beginning step in aiding the designer concerned with noise reduction. To be effective, his resource base must be broadened and we would applaud efforts by the Environmental Protection Agency to encourage research and develop pilot studies that would establish a broad-scale resource base.

We are delighted to find the EPA so deeply involved with the fundamentals of environmental protection. As landscape architects, we feel strongly that quality land planning deals with consideration of all elements, from the most fundamental land use studies to waste disposal to noise to aesthetics.

And here's where I could insert the cosmetic designers. Unfortunately, the history of most landscape architects' work has been that of cosmetics or that of coming in on the tail end of a project rather than at the beginning for the functional use of land in the proper special relationships of objects and the proper special relationships between objects.

Our society's membership has been involved in several projects where noise reduction was a critical consideration. In the weeks ahead we hope to be able to transmit documents concerned with site planning and noise abatement. We are pleased to have had the opportunity to express our views and concerns here today, and we would look forward to working with you further.

Thank you.

Dr. MEYER. Thank you, sir. Before I ask a couple of questions, panel? On the left? On the right?

Could I ask a question with regard to certain aspects of landscape architecture? Have you personally, or the association, been involved with the considerations of what ought to be done when you put a highway in a cut? You know, there's a lot of discussion now about—in fact, one of the other witnesses was inferring something about freeways being lowered. There is also a great tendency to avoid erosion simply by concreting the whole surface. Have you made any studies at all that would indicate that perhaps proper landscaping and setbacks——

Mr. SCHRICKEL. Mr. Chairman, there have been some studies regarding this. I believe, without quoting numbers, which I mentioned to Dr. Ward here prior to lunch, I'm not real versed in decibel chronological sequence. It has been, I believe, proven that by depression the slope of the land does have effectuation on the sound that occurs in the corridor of the freeway, mainly where the pavement is, and the noise from the tires and the vehicles. I'm going to suggest this may be a 95 percent scientific fact. I've heard figures that, with regard to slopes and with regard to landscape materials on slopes and depressions where we have cut areas through the earth, that the grass slope will double the reduction of sound, versus pavement. And, of course, you're familiar with the typical scene as you pierce the urban core of the need for minimum land, and suddenly enter a paved slope and the sound just keeps on reverberating. So, yes, sir, there has been some work done on that. There's been some research done on the mass planting of shrubs in order to absorb some sound. I can quote a figure, I believe. A privet hedge, a low dense shrub—depending on what part of the country you are from—7 feet high, supposedly reduced noise by 3 decibels. And there are other numbers, oh, like a hundred feet of forest might have the ability in the first 25 feet to reduce noise 25 decibels—I'm sorry. I think it's 7 in 25 feet.

Would you believe that?

Dr. NEWMAN. No.

Dr. **MEYER**. Dr. Newman has some firm views on that.

Mr. **SCHRICKEL**. Right.

Dr. **MEYER**. Do you have a question, Ted?

Mr. **BERLAND**. It was just along these lines. After hearing what Dr. Newman said and hearing about the grass and the other; are you saying that no one has established—all right, you've got forest and you've got privet hedge; what about all the other things?

Dr. **NEWMAN**. He mentioned land forms here.

Mr. **SCHRICKEL**. Right.

Dr. **NEWMAN**. That's what you deal with, land forms.

Mr. **SCHRICKEL**. Right.

Dr. **NEWMAN**. Solid things that will really stop noise, but let's stop this bologna about planting.

Mr. **SCHRICKEL**. You didn't hear me say that plant material was the sole answer.

Dr. **NEWMAN**. The land forms, that's the thing that does it.

Dr. **MEYER**. That's an important consideration.

Mr. **SCHRICKEL**. For example, there's a misnomer about trees. Trees really do not do a great amount of absorbing; they do scattering more than anything else. They do do some good towards the psychological end of it, in that you think that it's not as noisy. But this has been done and, oh, I guess because we're probably not big enough, strong enough, smart enough in trying to catch up, that's why you get some information in fault.

Dr. **MEYER**. I'm most anxious to receive that document.

Dr. **NEWMAN**. I'd just like to comment that in Baltimore a new throughway of some sort has recently been planned, and in that, some substantial percentage—and I'm not sure whether it's one, two or three, some substantial percentage—of that highway is going into land forms, which will mitigate the effects of that roadway through the city of Baltimore from an acoustical standpoint.

Mr. **SCHRICKEL**. This is another misnomer. One of the most beneficial things from the cuts and fills of roadways which the highway and road engineers have been involved in for years, is that the cuts and fills must balance. Well, I question the need of this balance when we're talking about cost factors with regard to a pleasant way to drive, a sound refraction means, a safety factor from a head-on collision with another factor. So these are the kind of things that are being done now. We're making some strides now, and we as a profession are just encouraging the Environmental Protection Agency to keep going, and we'll supply some help and you supply some help.

And I have a few other comments that aren't in the text that I would like to mention with regards to the ordinances and the comments about the zoning that I've heard this morning.

Dr. **MEYER**. Well, if you would be so kind as to make them right now, sir, we'll be happy to hear them.

Mr. **SCHRICKEL**. Fine. I'd like to answer Dr. Westman's question to Bob Wegner regarding the seminars and the airport environment study. I happen to have been a consultant for a school district that was in the process of locating schools—school sites for future schools. I happen to have been a member of a group that asked this airport authority, "What are the sound zones?" I don't know anything about them. Even today, I would love to go into a room and find out what really is 1 decibel and what's 22 with somebody. And I question how many of us in here really know this. But I had to take the expertise of the sound authorities with regards to recommendations to a school district based on the seminars as to where to locate a 3,000 complement senior high school, a 750 complement elementary school in a growth area out here near the Fort Worth-Dallas Airport. So, from a standpoint of, did the public or the people on the other end gain any benefit from the seminar, I would say this was very definitely so. One thing that I observed this morning was that, we were talking about the improvement of caulking for sewer pipes and the thicknesses of walls for apartment views, and the things that the automobile industry has done for sound; I had the feeling sitting there that probably we should open the door real quickly and race into the building. And I wonder what is really supposed to happen between the auto and the building, you know, where we spend some of our time. So this point should be considered in the way of what kind of controls will we have in public housing projects and all subdivision plats that are approved by the cities with regards to the level of noise between the building unit and the all-powerful automobile.

Dr. MEYER. A very good point, sir.

Mr. SCHRICKEL. That's our open space that we're trying to protect in cities today. And when you have been clobbered as many times as some of us have with landscaping for beautification alone, you really kind of get a little sensitive to these kind of things when you know that when someone says, "I'm going on vacation," there's not a soul that goes to an arid desert covered with concrete where there is a lot of noise. He goes to the nicest place he can go. So where does mankind really go? He goes where the noise level is down, where the environment is fine. Of course, I think our profession is one that is trying to make the city a good place to live and to work and to play.

Dr. MEYER. Well, you know, you raised the point—this occurred to us around the country at other hearings, and it was brought out with one of the witnesses here earlier yesterday—about 80 percent of the American public lives in these two hundred and some odd metropolitan areas and spend most of their time there. And you used the phrase a minute ago that strikes home; to a lot of people, the open space is the space between the points of transportation and the points of work and domicile. We forget that, those of us who were raised in this part of the world as I was and those of you who are living here where there are a lot of open spaces. But you hit your point right solidly; we've got to look at the noise and the mutual attributes as well in the whole environment.

Mr. SCHRICKEL. Well, you know, it seems like I'm constantly, since I have been practicing in the Southwest—and incidentally, I'm a private practitioner representing the national organization just because of the local convenience of distance between my home base and the public hearing spot. But for years, there's been this constant relationship of a small open space, like Rockefeller Square in New York City. Every time you go to a zoning hearing or a public hearing for open space in remote areas such as Dallas and Fort Worth where we're trying to preserve this and prove the kind of value that open space has. And of course, again, as a profession, we're not too large in numbers. We're certainly happy to see somebody arrive on the scene that can give some input and value to such things as a better place to live in America.

Dr. MEYER. Thank you very much, sir. I appreciate your comments.

Now, we have another element of the architectual profession now to hear from, Mr. David McCandless of McCandless Associates and also visiting professor of architecture at the University of Texas, Austin. Nice to have you here, sir.

STATEMENT OF DAVID McCANDLESS, JR., UNIVERSITY OF TEXAS

Mr. MCCANDLESS. Thank you, Dr. Meyer.

Panelists, ladies and gentlemen, before I begin my talk, I'd like to take you back and think for a minute here about the remarks of Bart Spano. He came up with a lot of examples; I'm not going to give any examples, really, not the kind that he gave. But I think his was a very good beginning to some of the things I'm going to say today. I think he threw a little mud at the architects, and being an architect I've got to catch some of that mud. And being sidetracked into acoustics now, I'm going to throw some more mud back to the architects. I think a few of the architects can bat it back again.

There is plenty of data available, as well as our own experiences, to convince us that many of our buildings and our homes are a lot noisier than they should be. And many of us know how to solve those problems when approached specifically. The more basic question that comes to mind is, rather, why do we have to have these problems to begin with? Is there anything we can do through education, enforcement, or creation of new trends or public demands, to improve the acoustical environment in which we live?

I want to present several observations which I have made over the past 9 years working as a consultant in architectural acoustics, serving many architects in many States. Since I am also an architect with 2 years of teaching and 10 years of practice before involvement in acoustics, I am very sensitive to the architect's education, his design approach, and his present professional problems relating to acoustics.

Probably the first problem relating to noise control in architectural design is the general lack of emphasis on acoustics in the training of our architects. A few colleges have good courses in acoustics for architects, but that varies with both curriculum and quality of instruction. Many colleges give our future architects very little useful instruction in acoustics, if any at all. Whether this condition is a result of the architects' own emphasis on visual design, or the lack of constant demand by the consumer for better building acoustics, is hard to say. The problem does exist. The schools must not compromise their emphasis on visual design, but they don't have to do that if they would strengthen their emphasis in functional design by greater awareness of the acoustical environments they are creating. To make this point more clear, I wish to quote a phrase I have often used in architect and student-architect groups: "When an architect designs a building he can see it in this mind's eye. He should also be able to hear it in his mind's ear."

Such an ability to anticipate the acoustical characteristics of a building requires both an understanding of room acoustics and noise control and the experience of listening knowledgeably to many architectural-acoustical environments. It is my firm conviction that developing this facility, which makes acoustics more of a design element in the architect's creative process, is the best way to make a positive improvement in the control of noise in and around the buildings our architects design. There will also be improvement in that other aspect of architectural acoustics, the environment that is created by the volume, the shaping, the finishes, and furnishings of rooms.

This ability to anticipate the acoustical characteristics of an architectural design should properly be fostered in the colleges of architecture. Instruction must include more than the typical lecture course. It should pervade all the classes in design, and it should be taught by faculty who also teach architectural design, so that it can be placed in proper perspective and more relevant in the design process.

I am not recommending that the architect do his own acoustical consulting any more than I would recommend that he do his own structural engineering. Without the engineer, for example, we would not have our great structural spans and multi-story buildings; but without the architect's understanding of steel framing, prestressing, posttensioning and so forth, we would not have these engineering feats properly incorporated into the creative design process.

There are many architects with whom we've consulted who have a respect for the acoustical problems of buildings, and who are aware that their buildings will have acoustical characteristics as well as visual characteristics. These architects, however, are only a small percent of those who are practicing. The majority of architects, unfortunately, show a lack of awareness of what they are creating, acoustically. We have usually found that the architect is only concerned and will get help only when the building is designed for concerts, or for some such acoustical use, when the client has an obvious concern to which the architect needs to respond, when the architect is aware, sometimes by personal experience, that the mechanical systems, adjacent activities, or outside noise could cause serious disturbance, or when such legislation as the Walsh-Healy Act, and its successors, creates specific limitations. Unfortunately, too many buildings, of all sizes and qualities, have been designed without these constraints.

Now, in defense of the architect, there are at least three major factors affecting the practice of architecture that are, we believe, direct causes of the excessive noise in our buildings today. These are factors over which even the most acoustically concerned architect has little control. They indicate why consultation is used so little.

First, very few architects can afford to hire a competent consultant regularly, and when they do they often negotiate only for what they consider the important acoustical problems. The only consultants which the architect is obligated to retain in standard practice are the structural, mechanical, and electrical engineers. In the past 25 years, however, the architect has had to include such other additional consultants as food service, architectural concrete, lighting specialists, stage equipment, and acoustical, to name a few. The architect has also had to develop new services within his own organization including programing of building uses and construction progress, and even financial planning for the client's benefit. Without these additional services from within and from outside their own organization, the architects cannot possibly produce the complicated structures which our society demands today. It is not surprising that the cost of practicing architecture has gone up more than the increase in fees which the architect receives. Unfortunately, acoustical consultation is too often one of the additional services that is not afforded, and the architect is seldom able to persuade the client to pay for this extra service, as the client should.

Sometimes the architect makes his mechanical engineer responsible for the noise control of the mechanical equipment in the building. This seems appropriate, but the engineers, as a group, seldom have any more understanding of acoustics than the architect, and their fees are so much smaller that they are not able to pay for an acoustical consultant. As a result of this situation, we have been paid by the architect to work with the mechanical engineer on most of our mechanical noise control projects.

A second factor which often causes excessive noise in our buildings is the cost of actually incorporating the proper construction, treatment, vibration isolation and so forth, that is required for adequate noise abatement and control. If the building budget is very tight, or if the bids for construction are higher than anticipated, it is customary to eliminate the frills in the design. Very often the appropriate noise control measures are compromised or eliminated in this process.

Unfortunately, it usually costs much more to correct acoustical problems when they are finally heard in the finished building than it would to control them by proper construction in the beginning, including the cost of proper consultation.

The third factor which often causes excessive noise in our buildings is the technical progress we've made in building construction. This factor is also one of economics. We have developed lighter and cheaper materials for both structures and enclosures, and we have developed more and more mechanical and electronic equipment to do our work and to control our physical environment. The architect is forced to design with the lighter building materials and for the least construction labor possible to keep building costs within the budgets the clients can afford.

Unfortunately, the light construction transmits noise and vibration more easily than the older construction, and the new mechanical and electronic equipment has turned out to be a source of more serious noise disturbances than we had before. It is regrettable that our progress in construction can often be considered a backward step as far as our acoustical environment is concerned.

We become more aware of the effect that the client's budget has on the quality of the acoustics in our architectural designs when we consider the successful acoustics in the new technique of office landscape planning. Actually there is nothing new to the acoustical principles of efficient absorption, space, baffles, background masking noise and so forth which are used in this open arrangement of office space. But the advantage to the client is one of much increased efficiency of operation and the ease of making changes in space arrangement. These are obvious financial gains for the client, and if he can apply office landscape planning to his business operation, he will afford the required acoustical guidance and interior treatment that is necessary to make the office landscape planning work.

Another factor of client influence affecting improvement in the acoustics of architectural design is the part played by some insurance companies as investors in hotel, office, and apartment projects. The insurance companies are requiring evidence that the architectural plans and specifications provide for certain basic acoustical standards or criteria before they will finally provide their share of the financing of the project. If such a trend could spread to all such investors, mortgage bankers, and others, we would see a significant improvement in the architectural acoustics of enough buildings to set new standards of performance generally.

In our consulting work we have found a specific misunderstanding of some basic acoustical principles held by a small percent of the architects and most of the contractors and suppliers. It is the idea that acoustics are something you can apply or install, like insulation. I believe that the misunderstanding comes from a simple lack of knowledge on two basic points.

First, you must recognize whether your problem is in the same room with you or transmitted from some other space. The problems of room acoustics require different solutions from the problems of transmitted noise.

Second, you can't insulate against noise transmission as you do to stop heat transmission. Glass fiber blankets and foam materials are poor barriers by themselves. It takes mass, limpness, and an airtight installation, and very often a discontinuity between the faces of a wall. When sound vibrations can't pass through the studs easily the insulation materials may then be used for a little advantage.

This misunderstanding about acoustical insulation is much more complex than we can go into here. I believe that it is basic to many of our problems in architectural acoustics, and that a very broad instructional program at all levels, including the consumers, is required to make a meaningful change in our noisy acoustical environment.

We can be thankful that the manufacturers of gypsum products, insulation materials, and acoustical ceiling tile have research programs and advertising campaigns that are quite educational on specific related issues. In fact, their efforts are essentially a search for individual ways to solve the problems we've created with our lighter materials and noisier equipment. While their work is of great benefit, it is on specific issues, not the broad concepts, and it is directed at few others than the architects.

The major problems I have discussed have related acoustics to education and building costs. Whether these problems can be improved through any legislation, I do not know. I am not optimistic. More relevant education in acoustics for student architects, for practicing architects, and for mechanical engineers is required to achieve a significant improvement in the acoustical environment through architectural design. But even with the education, the architect and mechanical engineer will often need the acoustical consultant. The private citizen, various foundations, and the Government will eventually have to support the education, the consultation, and the necessary improvements in building construction if we are to achieve progress in the quality of our acoustical environment. Unless these educational and cost problems are solved, we cannot effectively use our technical knowhow in acoustics.

Thank you.

Dr. **MEYER**. Mr. McCandless, thank you for giving us some real economics and facts. Panel on the right, any questions? Left? Ted?

Mr. **BERLAND**. You say, "Few architects can afford to hire competent consultants," when you were talking about various—well, you mentioned acoustics. But then you say that in the past 25 years the architects have had to include these. Now, who made them?

Mr. **MCCANDLESS**. Sometimes it's a pressure from the client, sometimes it is a result of their own experiences and they know they have to do a better job, various and sundry things. But when I say there aren't very many architects who use them, I'm speaking of the great majority. It could be answered, I suppose, by percentage, if we knew exactly what percentage they are.

Mr. **BERLAND**. I was really concerned with what pressures caused the change. There were no legal requirements?

Mr. **MCCANDLESS**. Not really.

Dr. **MEYER**. I have two questions.

Anybody else on the panel?

I'm sure that as an aside, I could ask one or two of our panelists what percentage of their budget—not dollar wise, but perhaps workload—was involved. I'll ask that privately because we do have some consultant people with us.

But the question I'd like to ask, number one, is: have you any feel for the additional cost associated with one or two average projects, requiring an architect experienced in providing and obtaining acoustical consultation, ranging, say, from a tract builder of a large FHA project involving two or three hundred individual homes up to, say, a job such as building the First National Bank Building of Dallas—percentage wise, not dollar wise? Do you have any feel for this?

Mr. **MCCANDLESS**. Golly, it's so variable. The amount of work that needs to be done from one project to another is really variable. A lot of it may depend on original planning as to how much really needs to be done. And you might say remedial in the sense of taking the plan scheme and making it workable before it goes out for bids. Remedy the plan itself. But you can start even earlier. It's very difficult to put some sort of a price or some sort of a percentage on that, and I suppose the closest thing we could come to is to go back to some of the remarks made by—for instance, the zoning building code that was mentioned this morning. If I remember correctly, some place from 2 to 10 percent increase in the cost made these buildings more sound proof.

Dr. **MEYER**. Yes.

Dr. **NEWMAN**. Dave, I might add a comment. You want to know what—you're talking about the cost for doing acoustic studies?

Dr. **MEYER**. Yes. What are the additional——

Dr. **NEWMAN**. In the most sophisticated, complicated, one of a kind—not the repetitious, where obviously the costs are way down—sort of study, for example, an involved multiuse municipal auditorium with a sound system and noise control and all this, the acoustical consultant fee can, at maximum, get to be a half of 1 percent of the cost of the building, that order of magnitude. It could be less. And in a big office building or school, Lord knows, it's a hell of a lot less than that.

Dr. **MEYER**. Well, that's what I was driving at. What is the magnitude of getting the type of consultation that you say is necessary? One of the things we're interested in is getting a feel for the economics of environmental control, which includes everything from the basic design to the actual application.

Mr. **MCCANDLESS**. If you took the architects' fee as being something like 6 or 7 percent—and, of course, that can vary considerably with the size and type of building—and consider that he has to put out a few percent for his mechanical engineers and so forth, and if he has all these additional services that were, say, a quarter of a percent or something like that, pretty soon he doesn't have any profit at all. In fact, maybe he can't cover his overhead.

Dr. **MEYER**. Well, something—Excuse me, Ted. Go ahead.

Mr. **BERLAND**. But doesn't he get more business if his clients can tell each other, you know, "He really builds quiet buildings or apartments or whatever"? Wouldn't it advantage him professionally?

Mr. **McCANDLESS**. He would certainly like to think so, but I think the advantages or results or rewards are so intangible that they don't really affect the price.

Mr. **BERLAND**. There are no quiet architects by reputation, or noisy architects?

Mr. **McCANDLESS**. I'm afraid not. Maybe that's what we need. You know, we've been talking about consumer awareness.

Dr. **MEYER**. Well, without belaboring the issue and taking up too much time, I would like to ask you one other question. About what percentage of time—or whatever way you want to answer the question, be it percentage of time or contact hours or semester hours or what—do you think ought to be devoted to environmental considerations in the architectural curriculum? Maybe you want to answer that later for the record, but I need some information for our deliberations in this. Have you thought about this at all?

Mr. **McCANDLESS**. Yes, I certainly have. I've thought about it a great deal, and I hope I can answer it quickly. I think that what the architects need is a degree of very pertinent facts, plus a lot of experience while he is in school. In other words, maybe a 3-hour lecture course at some appropriate point when he still has 2 or 3 more years of architectural design problems with somebody on the faculty—or hopefully many of the faculty—aware of the factors pertinent to good acoustical design, so that as the student's design projects are juried, the comments from the faculty will include what they see of the considerations of acoustics in his work.

Dr. **MEYER**. Very good, sir.

Dr. **GLORIG**. When we built the Callier Hearing and Speech Center here—and I'm not the ordinary customer when it comes to acoustics, obviously—but I did demand that we have acoustic consultation and did lay some prespecifications on paper prior to the actual construction. And the cost of this varied somewhere between 3 and 4 percent additional cost to the building.

Dr. **MEYER**. Thank you very much, Dr. Glorig.

Thank you, sir.

We'll now proceed to a topic of considerable interest and importance to the panel, and that is the question of noise isolation in low-cost housing. Dr. Elmer Hixson, also from the University of Texas, will give us a presentation on this subject.

STATEMENT OF DR. ELMER HIXSON, UNIVERSITY OF TEXAS

Mr. Chairman, members of the panel, ladies and gentlemen, I really come here to document a case of the situation where noise isolation has been ignored in low-cost housing. We probably don't need to document this sort of thing, since it is so widely ignored, but I think in the case of low-cost housing, it really should be an important factor, and I think that psychologists and the authorities on the panel could certainly speak more to this than I. But let me read from what I have written here.

Dr. MEYER. Yes, sir.

Dr. HIXSON. In late 1968, 10 single-family dwellings were constructed in Austin, Tex., under the sponsorship of the U.S. Department of Housing and Urban Development. The purpose of this Austin Oaks project was to develop architectural design, building materials, and construction methods to provide large numbers of single-family dwellings within the financial reach of low-income families. The University of Texas was asked to provide architectural, engineering, psychological, and sociological evaluations of these houses. Noise isolation studies were conducted as part of the engineering evaluation. And this is what I want to talk about today.

Standard FHA specifications were waived to allow innovation in the plans of these houses. Many plans were submitted; I think in the order of 80 or so. Ten plans utilizing a wide range of materials and construction methods were chosen. Most of the acoustic tests were made after the houses were occupied by the purchaser. Test results for six of the houses are presented here. It is the purpose of this report to point out the wide range and generally low values of noise isolation and the lack of consideration for noise isolation. In some cases simple changes that would add little to the cost could have resulted in large improvements. In one house, excellent isolation could have been obtained. Finally it is concluded that noise isolation should be a major consideration in housing for low-income families who are in the greatest need to enhance the quality of life.

The measurements that were made were of three kinds as specified by the American Society for Testing Materials. One of these was the field transmission loss which would be an engineering characteristic of a wall partition. The second was isolation between rooms, which was a subjective measure with the house as lived in. And the insertion loss, which is a measure of how well the house discriminates against outside noise. In all cases an interior bedroom wall was evaluated for the field transmission loss. A sound source was placed in the kitchen-living room area, which is expected to be the noisy part of the house, and then measurements made in each room. Insertion loss was measured for only one bedroom in each of the houses. Then for the interior wall, a field transmission class was noted from the data. Results for six of the 10 houses are given here, and those are chosen to show, (1), a conventional material as a reference, and (2), a wide variety of the characteristics of unconventional materials that were used.

Now, I'll need the viewgraph to present some of the slides here. But before we see this, I should point out that the field transmission—the field sound transmission class is analogous to the sound transmission class, which is measured in a laboratory, but these were measured in the field in a house that was constructed.

Some recommendations by HUD give 40 decibels as the minimum value of the sound transmission class for a wall between bedrooms, and 42 decibels for a wall between a bedroom and a living room. They also recommend 4 to 8 dB higher than that for houses in quiet residential areas. So keep that in mind, and as you see the slides, I think you'll have a comparison.

Mr. Chairman, this is an example of what I would call common practice in this part of the country. This home was concrete block exterior walls with sheetrock on two by fours for interior walls. And those are the main things to note. The wall that was measured between two bedrooms, characteristics of this sort, which are typical I think of these walls. The main thing to notice here is that this gives a sound transmission class of 38, as compared with a recommended 40 to 42, which comes pretty close to the recommended practice.

Now, when you measure the noise isolation between rooms, you would expect it to be almost as good as the walls. However, you see that the bathroom and bedroom No. 1 were closest to the noise source, and we see in the order of 15 dB isolation, indicating that the doors and other paths completely made—made the wall completely ineffective. So that one could improve it by improving the doors and other paths.

Now, when you measure the insertion loss, you would expect a concrete block wall, which is about 6 or 8 inches thick, to be a pretty good isolation from the outside. But you see it's in the order of 15 dB or better. But all of the houses had windows in each room, as you would expect, and I would recommend in this case that a double pane window be used. It's not common practice in this part of the country, but would greatly improve the acoustic characteristics, and also the thermal characteristics, at probably not much extra cost.

Now, here is a more unconventional construction. This was a sort of a unitized arrangement of extrusions that were spaced about 16 inches and then had panels in between, and the whole house was put together of these little posts and panels, as they call them. The mass of this wall was about the same as the previous wall, and you would expect the characteristics to be about the same. But the field transmission loss, as shown here, was about 8 dB less. The same characteristics, but certainly not as effective, possibly because of the wall not being quite as rigid as a standard wall. The noise isolation, again, very ineffective between the rooms, and having many flanking paths, I am sure. The insertion loss in the same order as the concrete block wall, but not nearly as massive. Here was a home that was basically a mobile home, very light weight construction. The wall material was about 3 pounds per square foot, which was very small. The walls tested here between two bedrooms—and we'll see the characteristics of that. The field transmission class was about 25; probably not too bad for as light a wall as it was. The noise isolation in this case in the same order as the characteristics of the wall, which indicated that better doors wouldn't have helped this; it would have taken better walls as well. The isolation from outside was almost nothing. You could hear your neighbors as well as the kids in the living room.

Here was an extreme case. This wall was made of twenty-seven thousandths of an inch thick aluminum panels with cardboard in between them. The weight of the wall was about one and a quarter pounds per square foot. And the whole house was built of this. The ceiling—it actually had no ceiling—the roof was of the same material, and it was a vaulted ceiling. This house was practically acoustically transparent. As you would expect, the transmission class was 19 for that wall. The noise isolation between rooms, the two closets rooms were the bathroom and bedroom No. 3, and as you can see, were in the same order as the wall characteristics. A little further away, you gain another 10 dB. I might mention that the owners of the homes said, "You should be here when it rains." Again, the isolation from outside was almost nothing.

Here was another form. This had a unitized construction in which this part of the house, the bath, the kitchen, the plumbing, and so forth, were premanufactured and set into place. Then the interior walls were actually vinyl-covered cardboard on 2 by 2's. The exterior walls were cast concrete. They were cast in place at the building site, and should have been very effective as far as outside characteristics are concerned. Surprisingly, the inside characteristics on this very thin wall were quite good, although I don't believe my data too well. It was marginal at best, and there were indications of flanking paths disturbing the data. So I can't speak too highly of it. The sound transmission class was 31 dB, which is surprisingly good. Now, here is an indication of a very serious acoustical oversight. Over each of the bedroom doors there was about 1-foot by 3-foot space covered by an open grille for the return air. And as you see, all of those bedrooms open directly into the living-dining room area, and the sound isolation was about 15 dB. So just a return air duct instead of those open grilles would have improved the quality of this house considerably. Now, the insertion loss to external noise was fairly good in this case, but I suspect that improved windows would have caused a much greater improvement.

Finally, here's a case in which the designer could have made a very good acoustically tight and noise isolated house if he had taken advantage of the materials he was using. This house was built of concrete sacks that were essentially dipped in water and laid up like brick. You may have heard of this method. He ended up with a wall of solid concrete around 6 or 8 inches thick, and the mass would predict the sound transmission of around 60 dB for this wall. Well, the exterior walls were made this way and one interior wall. We tested the interior wall expecting to get a very good sound transmission class from it. Unfortunately, as you can see, here's one example of the flanking path. He put a light stop across the top of the wall to keep the light from going through. Now, if this had been an acoustic seal here and the doors had been well sealed and heavy, he would have had a good room. Unfortunately, there were so many flanking paths, we really couldn't measure the field transmission loss. There were only three points indicated, and I don't believe that. So we ended up with a transmission class of 28. The noise isolation between rooms was actually a little better in that bedroom with the massive wall than the one that didn't have the massive wall. The others were quite poor. Then finally, externally you would expect to get good insertion loss because of the massive outside walls, but unfortunately, this didn't occur either. And in fact, during the test, standing in the room, you appeared to hear the sound coming from overhead from the roof. So the roof was the weak part of the design.

Well, that's the extent I would like to show of the data. Then in conclusion, I'd like to say that improved noise isolation could provide better rest and sleeping conditions for children, additional privacy for parents, could provide better family relations. This is in the psychological areas, but from my own experience, I think I could verify that. And particularly I think that such conditions are needed for low-income families to improve their quality of life.

Finally, we also need to know that their houses are not substandard. Thus, I'd like to recommend that improved noise isolation specifications be required for housing for low-income families, particularly those that are built with public funds.

Thank you.

Dr. MEYER. Thank you very much.

Panel?

Dr. WESTMAN. Dr. Hixson, I would like to underscore your conclusion, and add even more strength to your length of interior housing conditions. Certainly the incidence of disruption of marriage and the incidence of disruption from the point of view of behavior of children is concentrated in the low-income group. From the point of view of the expenditure of public money, it makes really more sense to have the highest quality of housing. And although we learned this morning that money doesn't always buy good acoustical conditions, I think your point is very well taken. It's in this precise location that the social problems are breeding, and certainly the living conditions are one of the important factors producing those things.

Dr. MEYER. Thank you. Anybody else on the left? Right?

Professor COLE. Professor Hixson, do you know when this project was started—when these six houses were designed and built—was there someone to consider the noise levels in construction?

Dr. **HIXSON**. No, sir; I don't believe there was any consideration given. The main thrust of the project was to develop materials, building methods, so that they could be projected to what it would cost to build many of these houses in one location. The loans were guaranteed by FHA, but the specifications were waived so that people could try different things.

Professor **COLE**. Is it fair to say from your general conclusion that these could still be low-cost houses following these techniques; they could be greatly improved acoustically with very little money?

Dr. **HIXSON**. I think that they could be improved considerably with very simple things, even, for instance, the very thin walls in which they had the quarter-inch plywood on 2 by 2 studs. Now, you could improve that wall considerably by just staggering the studs and separating the two sides. They were already flimsy, you know, you could push on them. That wouldn't make them much more so if you just staggered the studs. The quality of the fixtures, such as doors and windows and airducts, would greatly improve the characteristics.

Dr. **MEYER**. Sounds to me, too, Professor Hixon, like some of the things that you highlighted there would be sort of commonsense. And again, I guess what you're emphasizing is that we've got a job to do to educate people as to when they ought to apply this commonsense.

Dr. **HIXSON**. Yes. I don't want to sound like I'm faulting the designers or construction people here, because historically, they have had no consideration and have not been asked to have consideration for these factors. So they did as you might expect.

Mr. **BERLAND**. Along this line, has your study been published or presented to the professional architects or builders?

Dr. **HIXSON**. One presentation, which was at a national meeting for considerations in low-cost housing held in Missouri about a year ago.

Dr. **MEYER**. It's published now. It will be in the Government Printing Office. Incidentally, this is another purpose of the hearings, getting into the public domain a lot of information of this sort.

Dr. **HIXSON**. I think one of our usual problems is, the data has been presented to the Acoustical Society of America, but we just talk to each other and we don't talk to people who could do some good about this.

Dr. **MEYER**. Well, thank you very much, sir.

And now, I'd like to move on. We started off this morning dealing with the outside of the home, and what ought to be done about the communities, and some of the problems of highways and airports, and what the planners did. And now we've talked about the shell around which the living environment is enclosed. Now, I'd like to ask Mr. Herbert Phillips of the Association of Home Appliance Manufacturers if he would be so kind as to tell us a little bit about some of the things that have been done and might be done about noise associated with home products.

STATEMENT OF HERBERT PHILLIPS, ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

Mr. PHILLIPS. Thank you, Mr. Chairman.

Panelists, ladies and gentlemen, I appreciate the opportunity to come and talk at these hearings about home appliances.

My name is Herbert Phillips. I am the technical director of the Association of Home Appliance Manufacturers. I have a bachelor of science degree in mechanical engineering from Purdue University and I am a registered professional engineer in a number of States. I have spent all my professional career, over 25 years, as a practicing engineer in the home appliance industry. However, I am not an acoustical specialist.

The Association of Home Appliance Manufacturers, known as AHAM, represents United States' manufacturers of such products as room air conditioners, refrigerators and freezers, dehumidifiers, food waste disposers, dishwashers, ranges, humidifiers, and portable appliances such as irons, toothbrushes, shavers and so on. Its representation includes over 90 percent of the total production of these products in the United States.

In reviewing very recent data on sound pressure level measurements of some 31 home products, 20 of which are those manufactured by members of AHAM, the results show a variation starting from 43 decibels to a maximum of 75 decibels on the "A" scale measured at 3 feet.

It has been estimated that the hearing of 18 percent of the population would be impaired by exposure to the threshold of hearing damage, 80 to 90 decibels, continuously for at least 8 hours daily.

It is my understanding that this is the basis for setting sound level limits in the Walsh Healey Act to control noise in manufacturing plants doing work for the U.S. Government.

Therefore, in dealing with the sound of appliances, the industry has been dealing primarily with consumer preference and acceptance.

In cases such as food waste disposers, industry has produced products which are dramatically quieter, at a slight increase in retail cost, but the product has not met an enthusiastic reception in the marketplace. It appears that the consumer is not willing to pay even a small premium for reduced noise from a product that operates perhaps less than a minute daily.

Vacuum cleaner manufacturers have told us that they have been unable to sell quieter vacuum cleaners because their users do not believe these appliances are doing an adequate cleaning job simply because of the absence of the typical vacuum cleaner noise.

We know that a deluxe, low sound level room air conditioner has been withdrawn from the market because the increased price versus the lower sound level was not attractive to the purchasing consumer. These statements support one that I understand was made by a high school student yesterday. Dr. Fritz made a point of this also.

The industry, in its concern for its customers, has formed MACAP, the Major Appliance Consumer Action Panel. MACAP is sponsored by AHAM, the Gas Appliance Manufacturers Association, and the American Retail Federation. It is an industry-wide, but totally independent, organization formed to represent consumers in their dealings with the appliance industry.

Panel members are consumer experts from education, consumer finance, law and communications. They analyze correspondence from consumers and forward complaints, with their recommendations, to top management of the individual firm whose products are involved.

Only 5½ percent, 41 of the 751 complaints received this year concerned noisy appliances. With rare exception these noises were in conjunction with another complaint and were manifested by a failure that indicated need for repair, such as water in the transmission of a washing machine or the abnormal vibration of refrigerator tubing, which is easily adjusted.

It is evident from the foregoing that consumers are giving little indication of a desire for quieter products in their homes. Consequently, manufacturers hesitate to make large investments in research, engineering and manufacturing that will result in quieter, more costly products.

However, each manufacturer has conducted research and developed means for making his product operate quieter for at least the last 25 years that I have been a part of this industry and, as a result, home appliances have and are becoming progressively quieter. Today, home appliance manufacturers, due to recent interest from Government, environmental protection organizations, and others, are taking a closer look at this total program, and if it appears that there is a convincing need for even quieter products in the home, it will cooperate to the fullest with interested parties such as the Noise Abatement program and its Environmental Protection Agency.

Our focus to date has centered around the room air conditioner because sound from this appliance can annoy a neighbor rather than the owner. Would you believe that on a hot, humid, miserable night, it is not those conditions that keep a neighbor without a room air conditioner awake; it's the noise from his neighbor's air conditioner that's preventing that person in that room from sleeping confortably. And on a night which is quite tolerable, it is not the noise of that very same room air conditioner that is permitting that man to sleep. And as a matter of fact, it is that very same room air conditioner that is permitting its user to sleep when the aggrieved neighbor is having one hell of a party.

To date the industry, through its trade association, AHAM, has developed a sound rating standard for room air conditioners. It is presently working on an application standard which can accurately predict from the sound rating standard the noise output of a room air conditioner operating under virtually every installation condition.

The Association of Home Appliance Manufacturers, in cooperation with the Air Conditioning and Refrigeration Institute, AIR, has also developed a model sound ordinance for municipalities to assist them in the development of ordinances for the noise control of machinery such as condensing units and room air conditioners.

The home appliance industry represented by AHAM does $8 billion of business annually and has, over the years, proven that it does respond to the needs of the consumer, and its responsibility to the consuming public will not be reduced when it comes to developing quieter products for the home.

Dr. **MEYER**. Thank you, Mr. Phillips.

Panel, left?

Dr. **WARD**. Well, I think this is an excellent presentation. I just wish we had a little better documentation of the failure of the garbage disposer. But I mean, it sounds reasonable.

Mr. **PHILLIPS**. I can give you names, if you want them, sir.

Dr. **WARD**. And so one of the problems may be, in regard to home appliances, it may be a tempest in a teapot, so to speak, because until the people are willing to pay for what must cost more money, there is nothing that manufacturers can do. Except, of course, if the Government were to legislate and say they can't be any louder, so it really doesn't matter whether it's necessary or not.

Dr. **NEWMAN**. Some of these things, like the garbage grinder, can affect neighbors as well, even if the person himself doesn't give a damn.

Mr. **PHILLIPS**. But nevertheless, it's the person who uses it that has to pay for it, and doesn't consider his neighbor.

Dr. **MEYER**. Ted?

Mr. **BERLAND**. I find some of your remarks absolutely incredible, Mr. Phillips. I'm less restrained than my academic colleagues. First of all, when you talk about consumer preference and acceptance, I consider it a great deal of presumption on the part of the appliance manufacturers to say that they can leave it up to the consumer by setting up a so-called panel. I wonder how much communication the manufacturers have had with such true consumer organizations, Consumers Union, for example, in getting their opinion of the noise and other qualities of home appliances.

Mr. **PHILLIPS**. May I answer that, sir.

Mr. **BERLAND**. Go right ahead.

Mr. **PHILLIPS**. Of course, we are in close communication with the Consumers Union. But by the same token, MACAP, I think, gets more comments from consumers for home appliance products than the Consumers Union does.

Mr. **BERLAND**. I don't understand what your mechanisims for getting these complaints are. It's the first I've heard of it, and I'm a consumer.

Has anyone?

Mr. **PHILLIPS**. Well, many consumer magazines, newspapers, syndicated columnists say that if you're having trouble of any sort with your home appliance, first contact the person from whom you bought it. If you do not get satisfaction, contact the manufacturer. And then if you do not get satisfaction contact MACAP. Now, on the AHAM products, there have been 751 communications from consumers since the first of the year. MACAP has been in operation—I think this is their second year. In addition, they get communications from customers that have products other than home appliances that the Gas Appliance Manufacturers Association handles, as well as the American Retail Federation.

Mr. **BERLAND**. Seven hundred and fifty-one complaints in eight months for a population of—pardon me. I never heard of this before. And believe me, I have complained.

Mr. **PHILLIPS**. Well, we will be more than happy to have you——

Mr. **BERLAND**. I know people that have complained. Furthermore, next, I take some exception to the premise that it has to be more expensive to be quieter. A member of this panel at lunch was telling me how, for a matter of $2, he was able to quiet his dishwasher considerably. Furthermore, it seems to me that—and engineers have told me—that there are many ways of making appliances quieter without any more money. A vacuum cleaner is a very good example, by redesigning the impeller. Now, I keep hearing these statements about, "Well, we tried quieter appliances on the market—" like the lawnmower yesterday morning—"but it really bombed out." I don't know, sir, when you bought an appliance last, but when you go to buy a vacuum cleaner, the salesman will invariably say to the housewife or the husband, "Listen to that power." If you go to buy an automobile, the same thing, or if you go to buy a blender. "Listen to the power of that blender. That can really chew up things." It seems to me that part of the consumer preference and education also has to be done at the retail level. I would think that if somebody came out with a good line of quiet appliances that would not cost anymore just because they were designed to be quiet and someone sold them to the consumer as such, like Ford sells quiet cars, it would be acceptable.

Dr. **WARD**. But not necessarily preferable.

Mr. **PHILLIPS**. Right. And also I mentioned that——

Dr. **WARD**. I would, yes; you would, but does that mean that the average consumer would? Why are we going to force our essentially aesthetic opinions on everyone else?

Mr. **BERLAND**. Why would you think that the ordinary consumer would not?

Dr. **GLORIG**. I've had some experience in the chain saw——

Dr. **MEYER**. OK. Wait a minute. We'll start with Dr. Glorig and come back down the line.

Mr. **PHILLIPS**. Mr. Berland, you are too willing to overlook one of the statements I made, and that is that appliances are becoming quieter each year.

Mr. **BERLAND**. I do not find that they are. As a matter of fact—all right. Have you got any documentation for that?

Mr. **PHILLIPS**. OK. Compare a room air conditioner of equal capacity 10 years ago with one of the same capacity today.

Dr. **GLORIG**. The chain saw industry is a good example of what can be done to reduce the noise. McCullough engineers, whom I worked with for several years when we were out in California, designed a muffler. It would reduce the noise about 17 or 18 dB, which is a hell of a reduction. But when they put this saw on the market, the market did not want it for two reasons. First, it was an extra cost; second, it added about 6 pounds of weight to the saw. So it seems to me that the answer to this sort of thing, unless some sort of controlling recommendation or legislation—and I hate to use legislation if we can get away with it—says that you've got to do this. Then your competitors are not going to have a cheaper saw because they don't do the same thing you're doing. This is actual facts in the chain saw industry.

Dr. **WESTMAN**. And so the parallel there would be the use of safety glass, that really has to be legislated, even though people ought to know better. I'd like to take advantage of this opportunity to follow Dr. Ward's desire for hard data, and get the names of the vacuum cleaner and the air conditioner. I have used this example myself, and I've never been sure that I was talking about the right one.

Dr. **MEYER**. Would you mind furnishing that for the record, sir? I have to agree with the members of the panel. We get these things, in truth, by repetition. First, somebody says it in a speech, then it gets printed, then it gets quoted, and the next thing you know we do have truth by assertion. Some folks have sort of forgotten that a number of years ago another nation's leader, who was antagonistic towards us, made great use of truth by assertion. So, I do think it would be most useful to get this.

Mr. **PHILLIPS**. I'd like to mention now, if I may, the people at Sunbeam have told me that they have actually produced such a vacuum cleaner, and it worked perfect. And after it was used, it was returned simply because they thought it wasn't doing the job it should do.

And in the case of the air conditioner, it was a Frigidaire air conditioner.

Dr. **MEYER**. Well, we're going to hear from General Motors-Frigidaire in just about another minute or two, so maybe they'll want to address themselves to this specific experience.

Thank you very much, sir. I appreciate your willingness to come and expose yourself to pointed questions.

We'll now hear some specifics from one of the member companies. Is Mr. John Dorn, representing the Frigidaire Division of General Motors, present?

Mr. Dorn, I'm very happy to see you. I hope you're going to continue to be happy to be with us.

STATEMENT OF JOHN E. DORN, FRIGIDAIRE

Mr. **DORN**. Shall I talk about the room air conditioner first, or my prepared statement?

Dr. **MEYER**. Why don't you go ahead with your prepared statement, and at the right point interject the best comments that you feel would be appropriate.

Mr. **DORN**. I didn't really plan on talking about our quiet—or our superquiet room air conditioner, but I will.

Mr. Chairman and members of the panel, I am John Dorn, product safety director for Frigidaire Division of General Motors. My responsibilities at Frigidaire include all national, State, and local standards which affect our Frigidaire products, and therefore I appreciate the opportunity to present Frigidaire's views with respect to possible regulation of home appliance noise.

In the home appliance market, Frigidaire produces 12 products which are major appliances as opposed to small or portable appliances. We also produce automotive air-conditioning compressors and controls.

Frigidaire is but one manufacturer of over 60 manufacturers in a fiercely competitive industry that produces a variety of appliances. These manufacturers market units, for example, such as knife sharpeners, radios, hair curlers on one end of the spectrum, all the way to refrigerators, freezers, and microwave ovens on the other end.

Prices range from approximately $10, for instance for a knife sharpener, to over $700, for instance the 25-cubic-foot food freezer. As I will explain later, this variety of products and wide range of consumer prices bears importantly upon the cost-benefit ratio of proposed noise reduction programs for a given appliance.

At the beginning, it is important to qualify my remarks as they relate to the various levels of noise from home appliances, and also as they relate more particularly to Frigidaire's products. While I do not wish to hold myself out as an industry expert, it is my understanding, basically, that the home appliance industry has reduced the noise from its products to a level where most observers would feel it does not constitute a threat or annoyance to anyone's hearing.

Experts do not agree on specific threshold values for noise levels at which normal close conversation is impaired, or at which hearing loss is threatened. However, it would not be inaccurate to note that many place the threshold values for impaired conversation at the range of 70 to 75 db on the "A" scale, and possible hearing loss at the range of 80 to 85 db on the "A" scale.

A recent survey of Frigidaire's products indicates that we have reduced the noise from all of our appliances to where they are at or below these values. Most of our appliances are significantly below. Of course, some of our appliances, such as electric ranges, emit no noise at all. This survey, conducted in test rooms not dissimilar to the average home—your home and my home—indicate that our highest reading under maximum noise emitting conditions is in the area of 70 dB on the "A" scale. Our lowest reading is at 35 dB. Many of our more popular appliances range between 45 and 55 decibels, at least 20 decibels below the level where some experts have said normal conversation begins to be disturbed.

In this perspective, consequently, the public welfare is not at issue when a manufacturer considers whether to market a "super quiet" model in addition to a current model which is already free of annoying noise. On the contrary, it may be classified simply as an experiment to explore whether the consumer interest, which is already protected from annoyance or harm, is responsive to a new feature of performance.

Right at this point I can talk about our super quiet room air conditioner. About 4 years ago, we designed and developed what we called our prestige line of room air conditioners, which consisted of two models, 8,000 B.t.u.'s and 12,000 B.t.u.'s. They went on the market and were advertised nationally as being quiet, engineered for quiet. Pin drop quietness. There were several phrases such as this in the national ad. The unit has been discontinued last year because of low sales volume. There was a cost penalty of $40 per unit as compared with the same size of our other units and our competition, that is either 8,000 B.t.u.'s or 12,000 B.t.u.'s. This is the reference which the earlier speaker—this is the instance the earlier speaker referenced. These are facts.

This is quite a different ball game from the noise considerations which are applicable to products and activities producing levels about 85 and 90 dB. I question whether regulation in the case of the great majority of home appliances would produce any needed public benefit. The voluntary, competitive forces which have brought our industry to its basic position, as I have described it, are sufficient to bring further improvements as they become technically feasible and are of sufficient value to the consumer to gain public acceptance.

Frigidaire carries on its own research programs in order to continually improve our product line. In this respect, noise is no different from any other design problem.

While there are areas in which we routinely depend upon outside noise laboratories for special evaluation studies, by far our major research effort is an in-house effort. It is one of the main responsibilities of each of our project engineers who direct and design the development work of one of our appliances to reduce noise from the operation of his product.

Now, that is a component or a complete appliance.

This effort is a continuing, daily effort which, in an industry as competitive as is the home appliance business, is an essential element of good management policy. It would be difficult to assess a design objective more significant than noise reduction at Frigidaire, unless it is product safety. The fact that our customers live with our products many hours a day and throughout the night, forces a rigid discipline upon the designer to assure there is virtually nothing annoying about the product in use. At night, when environmental noise drops to very low levels, our automatically operated appliances must frequently operate within hearing distance of sleeping customers. This makes it mandatory that the noise emissions of these units not detract from that activity.

Thus, each project engineer must become very knowledgeable, in fact an acoustical expert, about the noise emissions from his product. To facilitate this continuing program, we have a noise laboratory at Frigidaire available for our work.

Finally, we participate with other member companies of the American Home Appliance Manufacturers (AHAM), in special research and study programs to solve problems of an industry-wide significance

As a result of the current low noise levels of most home appliances, it appears to us that the public does not feel it has a noise problem with respect to the great majority of appliances in the home.

Of course, there may be exceptions to a general statement such as this. There are no doubt a few appliances which, in operation, approach annoying noise levels. Also, some people are more sensitive to noise than others. You remember the curve this morning that was drawn on the board. However, it is my experience that even in those marginal cases, the public feels there is no noise problem for the Government to regulate, and by that, I mean in home appliances. Appliances in this catagory are used infrequently and only for a brief period of time, normally only a few seconds, as with a waste disposer. You turn it on for 5 or 10 seconds, it's finished its load and it's running quietly. Moreover, they are used only at the signal of the user, so he is expecting some noise. If you turn on your clothes washer, you expect to hear something happen. Thus, the annoyance factor is further minimized.

This general attitude on the part of the public has made it difficult for experimental noise reduction programs to succeed, such as the type I referred to previously, where super quiet appliances are introduced into the market at some cost penalty.

The reluctance, thus far, of the public to purchase super-quiet home appliances has sharpened the cost-benefit issue considerably. Because of this, it will not be easy to demonstrate benefits which will justify the added cost to the consumer for more quiet appliances. This will be true whether new noise reduction programs are voluntarily motivated or forced by Government regulation.

At Frigidaire, we are already at a relatively high level of achievement. Our work in noise suppression has followed a pattern often seen in the case of other control programs. Some of our first efforts provided significant results at little cost to the consumer. As we proceeded, however, we found that additional improvements came in smaller magnitude and at higher cost.

Further noise reductions from our current levels, while in some cases technically feasible, are likely to add significant costs to the consumer. Even so, we would be the last to suggest that there could be no further noise reductions on our products. As I've said earlier, the great continuing thrust of our design and development work is to improve our products in every way, yet we have to remain competitive. This includes a major effort in the field of noise.

What I am stressing is that these improvements can come at a forced pace, as would be true under Government regulations, or they can continue to come voluntarily, as they have come in the past.

Since the Government cannot give full consideration and effect to all the variable lead-time requirements of more than 60 manufacturers in the home appliance industry, the forced pace of Government edict is likely to add unnecessary costs to the product. These costs would result from crash programs to meet new standards and effective dates.

On the other hand, competition will exert pressures on manufacturers to continue noise control development. As other speakers have indicated, we are living in a competitive society and this is very true of the home appliance industry. Without the wasteful programs made necessary by early mandatory effective dates. In these circumstances, the likeliehood is that improvements can be phased in with little or no new cost to the consumer. Moreover, since the home appliance industry has already achieved a low level of noise emissions, the voluntary route will not impose any risk of health or welfare loss to the public. Once again, I am talking home appliances.

I suggested earlier that the wide range of prices for various home appliances may present a difficult problem if individual appliances are forced to lower noise levels. By way of explanation, some appliances thought to have a noise problem cost as little as $10. A great many others are priced in the $200 range, while others cost as much as $700. If a noise reduction program costs $5 or $50, depending upon the type of appliance, it is therefore more likely to appear as a disproportionately large share of the total purchase price in the home appliance field than in other fields where the purchase prices are much higher. In short, the consumer may be more likely to notice and resent costs added to his home appliance purchase. He is also less likely to observe meaningful improvement.

As I reviewed the possible participation of Government in this field, I concluded:

1. That discretionary power might be granted to an administrative agency to promulgate noise standards where a demonstrated need exists and where they can be justified on a cost-benefit basis, and

2. That technically sound testing procedures might be issued where none are available at the present time.

With respect to No. 1, this would permit government to exempt or by pass areas where voluntary efforts have achieved sufficient low reduction levels. As a parallel consideration, the agency would not be forced to issue standards where the costs outweigh the benefits which might be expected to follow the regulation.

With respect to No. 2, it would permit government to contribute where industry has not established a uniform test procedure. This would bring reliability to consumer information on noise levels which are now subject to some variation depending upon the various test procedures followed.

Where standards are issued, it is important that they be on a national basis, so that manufacturers of appliances, which are produced on one assembly line, will not have to meet several different and perhaps conflicting levels of regulation. In this regard, I would echo the testimony of witnesses at previous regional hearings that a strong Federal preemption clause be written into the bill.

Finally, may I say for Frigidaire that government noise standards do not appear necessary in the home appliance industry. For those few exceptional appliances where the noise levels might be considered objectionable, the forces of competition will be adequate to bring the desired change. I'm speaking from history; it's been proven out. Any forced noise reduction which is imposed upon the entire home appliance industry is not likely to provide benefits which are justifiable on the basis of added cost to the consumer.

Thank you.

Dr. **MEYER**. I want to thank you. Before I ask a couple of questions, I'll see if the members of the panel have any comments or questions. I'll start this time on the extreme right.

Professor **COLE**. Mr. Dorn, we heard this morning the suggestion that appliances be labeled specifically with a precise sound emission, or something of this sort. I presume this is simply a part of the specifications plan on appliances. Do you have anything on that suggestion?

Mr. **DORAN**. I can speak as an individual manufacturer, not as representing the complete industry. Yes; we've considered the labeling aspects, and we know that the proposed legislation has an act that's in this field and so forth. Our thoughts would be something like this: We would object to a label that would be a specific of, say, 55 dB on a clothes washer. We would not object to a label that would show a range or a rating, such as class A. In other words, if a regulation would impose a class of ratings for a good reason, such as being below some specific level, and you would have class A and class B and class C, Frigidaire would not object to this type of labeling. But to have a specific label, such as 55 dB on a clothes washer or a refrigerator or a dryer, this would impose upon us added legal responsibility. We would then have to test it. We would be tied into the warranty from that day on. Therefore, we would object to this type of labeling. I'm speaking as an individual manufacturer.

Dr. **MEYER.** I'd like to come back to that one in a minute. Aram?

Dr. **GLORIG.** In your testimony, you stated, "On the contrary, it may be classified simply as an experiment to explore whether the consumer interest, which is already protected from annoyance and harm, would be responsive." What do you mean by, "protected from annoyance"? Have you got some sort of criteria that says that they are not annoyed, or how did you base—what is this based on?

Mr. **DORN.** I was basing this on these levels I mentioned earlier, that when you reach a harmful effect——

Dr. **GLORIG.** You didn't say, "harmful noise." They aren't the same thing at all.

Mr. **DORN.** The harmful effect, of course, has a higher level. This is the 85 dB that I referenced, and I'm sure you heard from other witnesses. The annoyance level is something lower than that, and would depend, of course, on the user. This can vary far more than the harmful level. Many people, as we've indicated, are much more sensitive to noise than others. It's our experience from our own surveys on our customer reactions, that our users are not annoyed by the appliances.

Dr. **GLORIG.** This is what I wanted. How did you know they were protected from annoyance? Did you ask them or survey them, or what?

Mr. **DORN.** Yes. This would be the individual survey that the manufacturer conducts. Frigidaire conducts such a survey.

Dr. **MEYER.** Panel on the left, any questions?

Mr. **BERLAND.** Yes; I have two questions. One is: Between the manufacturer and the consumer, besides the wholesaler, is the salesman. And we talked yesterday and today a great deal about education. And I know from buying things, and everybody has had the experience, if you go to buy something, a salesman will say, "You don't want that; you want this." And I know, when manufacturers come out with a new line, such as color televisions, they have a rather extensive sales education drive. I wonder if there was any sort of movement along this line with the introduction of your quiet air conditioner?

Mr. **DORN.** I might add that if there was, it wasn't sufficient. I'd say that, yes, there were some plans made, certainly, to advertise to that segment of the public who would be interested in the superquiet appliance, such as our room air conditioner, our prestige line. And evidently, it was not sufficient. It was not recognized as having added benefit to the consumer. The sales volumes were very low and we discontinued it.

Mr. **BERLAND.** Okay. The other question was: As a member of AHAM, and since Frigidaire has, as you indicated, done a great deal of research in quieting appliances, has Frigidaire recommended an industrywide thing? I mean, if everybody made quiet air conditioners, then we would have quiet air conditioners.

That's rather obvious. If everybody made quiet food disposers, we would have quiet food disposers. Has this ever been proposed —you were talking about voluntary controls—through your organization?

Mr. **Dorn**. The answer is "Yes and no." Yes, in the case of the room air conditioner. We have recommended an industrywide program, it's going on today. We have a sound standard, as indicated earlier by the previous witness, in room air conditioners. The answer is no on the other appliances. We do not see the need of an industrywide program on the other appliances on the noise levels.

Dr. **Glorig**. Do you differentiate need from demand?

Mr. **Dorn**. I would say they would be very compatible.

Dr. **Meyer**. Panelists on the left?

Dr. **Westman**. I did not respond initially because I wasn't sure of my data. But I've pulled out a study carried out on household appliances that indicated a finding that might be of interest. My understanding is there will be a subsequent hearing devoted to the psycho-physiological aspects of sound. But the information that we have available to us to this date would indicate that there is a response in the central nervous system that can be measured through heart rate blood pressure, changes in the size of pupils and so on, at levels of sound about 60 decibels. And the annoyance level has been regarded as 50 decibels. Now, my question is this: If these findings are substantiated and we can add the third point—you're talking about you don't want to injure your health from the point of view of reducing hearing. You don't want to injure relations between people by interferring between conversation. Now, if there's a third piece of information that comes along, namely that we're all being affected by sound, whether we realize it or not, then I think this is a very important point. Consumers may not be aware of the contribution that this noise is making. As I indicated earlier this morning, most of the people we work with talk about nervous tension, and are really not aware of the contribution that sound has to this. If this can be substantiated, what would the reaction of Frigidaire be to this point that arises not from consumer need or from consumer demand, but from health research?

Mr. **Dorn**. If this third level, as you're indicating, could be substantiated, then we would take it as a need, as I indicated earlier. And yes, I believe our company would initiate, through AHAM, an industrywide program. At least, we would certainly request it. We are, of course, one member, but we would request such a program.

Dr. **Ward**. Don't concede too much here before they prove this.

Mr. **Dorn**. I said, "If."

Dr. **Meyer**. He said, "If."

Dr. **Ward**. Because there is quite a difference between affected and adversely affected. And the fact that these things are demonstrated at 60 dB—given a couple of electrodes and physical recording equipment, I can demonstrate changes in the nervous system at 10 or 15 dB. Does that mean that they are adversely affected? Not at all.

Dr. **Gloric.** You can demonstrate the same effect when you turn on a light in a dark room. My voice is making more than 60 dB at my ear now. Am I being affected by it?

Dr. **Westman.** Yes.

Dr. **Meyer.** Well, I hope everybody realizes that we're still trying to get all the facts.

Ted, do you have a question?

Mr. **Berland.** Well, if—if this is proven or indicated, then we have to say, at what level does it become indicated? At what level —not only will Dr. Ward be happy—I know he will have his own answer—but at what level will Frigidiaire say, "Okay. These are the findings; these are the levels where we start doing something." How does that happen?

Mr. **Dorn.** Well, I think this goes back to the need or demand factor that we talked about earlier. I couldn't say exactly what the level would be, whether it would be 45, 50, 55, 60, 65. I think it has to be proven somewhere that there is a need for this type of activity. That need could depend upon various factors. This is what has to be shown. It has to be shown there is a need.

Dr. **Meyer.** Ted, may I?

A couple of questions I'd like to ask are somewhat technical, perhaps. And so you'll understand the thrust of my question—one has to do with the circumstances under which you conducted your tests, the results of which you gave as the values that you reported—before you answer, let me tell you what the thrust of it is. Those of us who know a little bit about acoustics know that the method of installation can either reduce noise or enhance the generation of the acoustical energy. Let's take the dishwasher, for example. Do you have special mountings or typical mountings?

Mr. **Dorn.** In other words——

Dr. **Meyer.** When you set up in the test room, were the appliances specially mounted, or were they mounted the way the average contractor might mount them. Or how?

Mr. **Dorn.** Well, the readings I gave you earlier—now, let's take the dishwashers. The readings I gave you earlier include not only our Frigidaire laboratory kitchen, but also readings from a dozen customers of their Frigidaire dishwasher. The typical installation in your kitchen and my kitchen. They were not the same. The readings were varied then in a range, such as 40 to 50 decibels, under those conditions, at a 3-foot distance.

Dr. **Meyer.** This is the point I wanted to get. These are average readings?

Mr. **Dorn.** Yes.

Dr. **Meyer.** Then this leads into my next question. Has Frigidaire Division of General Motors or this AHAM acronym—and I'm not poking fun at it because——

Mr. **Dorn.** I understand that the Government has many more of these than we have.

Dr. **Meyer**. I was going to say, interestingly enough, the official governmental office symbol for the Office of Noise Abatement and Control of the Environmental Protection Agency is not ONAC; it is A-M-E-N, AMEN. But to get back to my question: Have you undertaken to provide information to builders, architects, and even to the individual purchasers with regard to installation so it will be quieter, or as quiet as possible? Do you furnish instruction sheets to your dealers of this sort?

Mr. **Dorn**. Yes. Frigidaire does furnish instruction sheets to dealers and installers of most of our appliances.

Dr. **Meyer**. Do they treat the question of how to do it so it will be the quietest?

Mr. **Dorn**. Not particularly in those words. Of course, that is in the consideration of the design engineer when he prepares these installation instructions.

Dr. **Meyer**. The reason I'm asking the question is not to embarrass the company, but to find out another way of getting at this problem of doing the possible with what is now available. The next question that I would like to ask you is—again, perhaps this is something that has to be pointed toward the kitchen designer. But if several of these products in the industry which get up to, say, 75, or even 60 or even 50 dB as measured on the "A" scale are put close together and turned on, you get another 3 dB(A). I calculated here just a minute ago rather quickly. If you had four 75 dB(A) devices on at the same time within a geometric arrangement so that somebody was within 3 feet of them, you would have about 80 dB(A), or a little bit over. Has any consideration been given, perhaps not to the architect or the kitchen planner, but again, to the individual who simply walks in and decides he wants to buy another device and stick it in his home? Or is this something we in EPA had better do? That's my question.

Mr. **Dorn**. I would think that this would be in the area of consumer education. Probably your agency would be qualified to handle that. Industrywide, we have done very little in this regard.

Dr. **Meyer**. Thank you very much, sir. I appreciate your candidness in the presentation and then your answers.

At this point, we would like to take about a 5-minute stretch break. And again, I'm saying really 5 minutes. We'll wind up today's discussion with a presentation about air conditioning and home ventilation from two elements of that industry.

(Whereupon, a brief recess was taken.)

Dr. **Meyer**. Ladies and gentlemen, I'll appreciate it if all those present will sit down so we can go ahead and undertake the rest of the day's activities.

We didn't put the air-conditioning people at the end of this because of any depreciation of their ability. But we thought it might be a wise idea to sort of cool things at the end. At this point I would like to announce that Mr. J. E. Duff of the Hoover Corp. who was originally going to be here called me before I left Washington and stated that because of some change of circumstances relating to other duties in his company having to do with the wage-price freeze he would not be able to be here. But he asked me to submit his statement for the record and I will now do so.

STATEMENT OF J. E. DUFF, THE HOOVER CO.

Mr. DUFF. Ladies and gentlemen: First of all, I want you to know I am delighted to be here to represent my company and I suppose in some small way to represent our industry.

The Hoover Co. has been in business for over 60 years, and not unlike other companies, we've had our ups and downs—our good years and bad. But fortunately for us, we've had more of the former and today rank in the Fortune 500.

We like to think that our growth was brought about because we have always aimed for a quality product at a reasonable price. A quality product means many things to many people, but one of the things it means to us at Hoover is an acceptable noise level.

We are well aware of the need to reduce or perhaps some day even eliminate noise in our products. In fact every year we spend tens of thousands of dollars in a continuing effort to reduce the noise of our products and we have been successful. For example, a typical vacuum cleaner produced in 1935 of the upright type with a rotating beater and brush in the nozzle used a 1/6-h.p. motor and created a noise level of 79 dB (C scale). Today a similar type of machine using a ¾-h.p. (or 450 percent more powerful) motor, cleaning at least 100 percent better produces a noise level of only 80 dB (C scale). A difference you couldn't hear. Hoover and other manufacturers are aware of the need for quiet machines, and through continuing engineering efforts have developed products no noisier today than those of 35 years ago, yet with a much enhanced functional capability.

To do this at Hoover we have built up a rather impressive acoustical facility consisting of a sound room 10 x 10 x 15 feet of solid concrete walls, floor, and ceiling. This room is totally suspended on springs so that no vibrations can be transmitted into it from the rest of the engineering facilities to interfere with measurements being made. Used with it are General Radio noise measuring equipment of the latest type. This facility is operated by a graduate physicist, skilled in acoustics, who together with other engineers, technicians, and so forth, work with the apparatus to measure sound levels and do the research necessary for achieving noise reduction.

In addition we retain a consultant, Mr. Harold Mull of Harold R. Mull, Bell & Associates, a recognized authority in the field of engineering acoustics to help us when we encounter problems beyond our capabilities. He has worked with us constantly over the past 10 years and has been extremely helpful.

But we don't stop with a technical evaluation of our new designs and products. We also try to make effective use of the many new materials which are available to us today, which can help minimize the generation and transmission of noise, in the basic design of these products. For example, Hoover appliances now use materials such as polyurethane foam, high damping plastics, and noise deadening coatings, none of which were available only a few years ago.

I am sure none of you have ever heard of a plastic bell or gong. Well this characteristic of damping out sound rather than "ringing like a bell" permits us to put high strength plastic materials, in many design areas, with a consequent reduction in noise level.

However, after the design is completed, the models built and the laboratory tests run the question still exists: Is it quiet enough? To help us judge this we build experimental models which are actually put out into typical homes, sometimes for months before production is begun. Here we are using the homemaker in obtaining a subjective rather than technical judgment of our appliance noise levels.

If I may be forgiven a plug, however, these techniques have been successful. Our engineering tests tell us that our Model 843 Constellation cleaner is probably the quiestest full power cleaner now available.

At this point I would like to shift from the engineering considerations of the design of appliances to a broader look at the products themselves. I think there may well be a potential danger in your consideration of all home appliances as a single class of products for which you may or may not recommend legislation to the Congress. For example noise is inexorably tied to function and as function changes so will noise generation. Let's for the moment compare a room air fan to a blender. Each does its own job, each contributes to the noise environment in the home, yet to expect the blender to ever compare with the fan in noise level is probably unrealistic. You'd have to hide it in a safe to do it. The point I am trying to make is that in some cases, requiring products to meet an arbitrary level—say 70 decibels—might well result in a design so costly or so bulky that no one would be interested in purchasing it, and by legislation you have denied the homemaker the choice of opting for performance and compactness even though its noise level is relatively high. Thus you will probably find it necessary to study the field product by product rather than as a single class of contributors to the problem.

Today in much of this talk I have specifically referred to vacuum cleaners since these are among the oldest of motor-driven appliances in the home. However, a similar story can be told for nearly all other appliances of the motor-driven type in the United States today. Today in the stores across this land, Americans have a greater variety of appliances to choose from and a larger number of manufacturers are represented than ever before. No one who hopes to remain in this business can ignore the wishes of his customers and our engineering research will continue to satisfy these wishes. Our market research continues to tell us, however, that while the homemaker would like a totally quiet cleaner, or even one somewhat quieter than today's models, she places noise in fourth place behind safety, performance, and cost as a factor in making her choice.

In summary, therefore, based on our experience of 60 years of trying to succeed by offering our customers the safety, performance, and quietness they are seeking, in products at a reasonable price, we feel that there is no need for legislation at this time dealing with the noise levels developed by home appliances of the types produced by the Hoover Company.

Dr. MEYER. At this point now I'd like to ask Messrs. Thompson and Martin of the Home Ventilating Institute to come forward and give us some further information about, not only home appliances, but other aspects of ventilation as well. Gentlemen, nice to have you here.

Mr. THOMPSON. Thank you, Mr. Chairman.

STATEMENTS OF E. B. THOMPSON AND W. G. MARTIN III, HOME VENTILATING INSTITUTE

Mr. THOMPSON. Panelists and all of you that are here in behalf of a quiet home, my name is E. B. Thompson, and I appear before you on behalf of the Home Ventilating Institute, the HVI. HVI is an association of manufacturers of range hoods and wall and ceiling exhaust fans. And I also appear on behalf of a member company, Kich-N-Vent Division of Home Metal Products Co. of Plano, Tex., of which I am vice president of marketing and sales.

I also speak to you as a past president of the Home Ventilating Institute, and I served at a time when our industry began to explore what it could do to formulate standards to foster quietness in our exhaust fans and range hoods. I speak also as someone who watched the beginning, watched the heartaches of development, and through more than 10 years of painstaking efforts, watched a program bloom into a full-fledged functioning program of certified sound ratings which we introduced in the spring of this year 1971.

Our new sound rating program is a pioneering one among products for the home. Its ratings are a workable tool which consumers themselves can use as an aid to improve their home environment.

Our experience demonstrates that an industry can develop a meaningful program of sound ratings and certification appropriate to its products.

We have also found that sound emission ratings are good for consumers and good for our business.

Perhaps our program—HVI's program—can provide useful guideposts to other industries and to the Environmental Protection Agency and other governmental bodies which have a role in quieting our environment.

HIV's certified sound ratings are the offspring of the basic ratings which our industry needed to develop first—ratings for ventilating performance.

In the founding days of HVI, which was in the late 1950's, responsible elements of our industry became determined to deal with a chaos of ventilation claims.

It had been effectively shown at that time that exhaust fans and range hoods could do an effective and useful job of removing airborne grease, smoke, fumes, moisture, and heat from kitchens, bathrooms, laundry rooms and other areas of the house. But at that time the consumer had no way of knowing which fans were effective, or even how effective they were. Ventilation equipment was sold with no ratings at all, or if they did have a rating, there were no laboratory controls, and there were no comparable tests.

The engineers from the HVI member companies, individually and collectively in committee, investigated various scientific facilities and studied relevant standards of scientific and technical organizations. And as a result, and because of its long experience in air movement engineering, the Texas Engineering Experiment Station of Texas A & M University was finally selected to develop a new facility to test household exhaust fans and range hoods under identical conditions simulating the use in the home.

The resulting laboratory was, and is today, completely independent of control by the companies which send their products there to be tested. The test results are converted into certified ratings by the HVI's professional managers according to uniform and impartial procedures.

In 1968, certified air movement ratings went into effect, and in that same year HVI began investigating possible sound emission ratings. A variety of scientific and technical criteria and already established standards were the possible building blocks for our new program. But as it developed, our engineers had to select, adapt and refine them to our particular application.

All of this took time and money—about $100,000 from the HVI members—to create a suitable and effective sound testing laboratory at Texas A & M. When we began to get these test reports, each member company had to step up preparations for a new phase of competition. Design work was necessary to bring certain products within the limits of our sound certification program. But the bulk of our design work, which was done by member companies, was to upgrade from the minimum and to compete in quietness.

Our industry was mindful that a new spotlight would turn on in April of this year with the first publication of sound ratings with air movement ratings in the HVI Certified Home Ventilating Products Directory, a copy of which we have appended to the back. We knew that all our customers and all our competitors would be watching and listening, figuratively, if not actually.

Our industry's interest in letting consumers judge our products on the basis of certified performance and uniform standards paralleled that done by the Government's interest in standards to protect the home buyer. As HVI developed its ventilation standards, we kept in close touch with the Federal Housing Administration. The FHA, with its minimum property standards, cites the HVI label as evidence of compliance with FHA standards for mechanical ventilation. And the FHA has approved our sound testing procedures and standards.

Twelve manufacturers, who account for the bulk of the home ventilation market, have the HVI tested-certified label on their products. They are Air King Corp., Broan Manufacturing Co., Emerson Electric Co., Chromalox Comfort Conditioning Division, Fasco Industries, Miami-Carey Co., a Division of Panacon Corp., Nautilus Industries, a Division of the Tappan Co., NuTone, a Division of Scovill Manufacturing Co., Rangaire Corp., Roberts-Cobell Division, Swanson Manufacturing Co., Thermador, Division of Norris Industries, Ventrola Manufacturing Co., and my own company, Home Metal Products Co., Kich-N-Vent Division.

Significantly, Montgomery Ward & Co. recently became the first national merchandiser to adopt a policy of qualifying all of its range hoods, wall and ceiling fans for HVI certified performance labels.

For a better understanding of our program, and for your reference, I submit a copy of our 1971 HVI Certified Home Ventilating Products Guide. It contains dual air and sound ratings for some 350 consecutive models.

The reaction to this publication of these first sound ratings indicates that there is a real market for products that respect quiet in the home. We have every expectation that when the next directory is published it will carry new members and more new models to do a better job of clearing the air of indoor pollution, and do it quietly.

Now, at this time I'd like to yield to Mr. Martin, another representative of HVI, who is well qualified to explain the technical aspects of our rating program.

Thank you.

Dr. MEYER. Mr. Martin.

Mr. MARTIN. Mr. Chairman, my name is W. G. Martin. I am chairman of the Engineering Committee of the Home Ventilating Institute and vice president of engineering of the Chromalox Comfort Conditioning Division of Emerson Electric. On behalf of both HVI and my company, I have been actively engaged in the HVI sound rating program from its inception, which was about 10 years ago.

In those days, of course, there was no Environmental Protection Agency, nor the present intensity of public concern for safeguards to the environment. But, as you have heard, quietness was next to ventilating performance as an objective within our industry when we started working on standards more than 10 years ago. The sound emission problems of home exhaust fans are different in basic elements from many that the Environmental Protection Agency deals with. Unlike some sound sources in industry and construction, exhaust fans do not pose a threat of hearing damage. Unlike devices which run continuously or for long periods, kitchen and bathroom fans are turned on intermittently and for short periods, which modifies concern about them as a sound source. Nevertheless, we recognized that quieter fans would be good business—by offering more options in quietness, as well as in ventilating performance and other product features, we would widen product appeal to consumers, and therefore increase sales.

Selling quietness, with meaningfulness for the consumer and with fairness in the competitive marketplace, meant adopting a system of ratings to be stated in simple and legitimate numbers.

Fortunately, our investigations led us to the conclusion that we did not have to invent a numbering system which would do the job. Already established in the scientific and technical community was the sone, an internationally recognized unit of loudness which simplifies the reporting of sound output. I say the rest of this with some deference since you are a panel of acoustical experts, but nevertheless I would like to proceed, if I may.

Dr. MEYER. For the record, it will be very fine, sir.

Mr. MARTIN. We chose the sone because it translates laboratory readings into numbers that correspond to the way people sense loudness.

As you panel members are aware, sones follow a linear scale, like inches. A fan rated at 3 sones makes half as much noise as a fan of 6 sones. In contrast, decibel readings follow a logarithmic scale, as you know, that does not necessarily correspond linearly to how people experience loudness.

As the 1968 report of the British Committee on the Problem of Noise observes, decibel readings may confuse the layman. It gives us as an example comparative readings of a heavy diesel vehicle at 25 feet and a soft whisper at 5 feet. Decibel readings make the diesel appear only three times as loud as a whisper, but in sones it's 70 times as loud. The sones comparison conforms to normal judgment of relative loudness, in the British report's words.

Our system, in short, gives single-number, linear ratings which the layman can use. It is most easily understood by most buyers. And it is based upon technically accurate measurements under uniform laboratory conditions.

We have set limits beyond which exhaust fans are not certified. These limits are 6.5 sones for bathroom fans and 9 sones for kitchen fans of up to 500 CFM capacity. In practice, very few models in the first listings come up to or near these limits. Future listings will move further away from the limits, we predict, as consumers and the builders and dealers serving them select desired combinations of quietness levels and air movement for protection of home interiors and for comfort and health.

Our ratings system is attuned to changes in ventilating power and sound in a single fan. Many fans have different speeds, some with solid state controls for variations in speed for different ventilating tasks. Generally, low speeds produce less sound output.

By HVI rules, multiple speed fans must be rated for air and sound at top speed and may be rated at lower speeds also.

The HVI Sound Test Procedure is submitted to you for your information and reference, along with two related documents, Air Flow Test Procedure and Policies and Procedures for Testing, Certification, and Labeling.

The sound test procedure has a two-fold purpose: One, to provide procedure for measuring sound output, and two, to establish a method for interpretation and/or presentation of the measured data.

As you will note, our sound test procedure makes reference to various published standards of the American National Standards Institute and the American Society of Heating and Refrigeration and Air Conditioning Engineers. Our airflow test procedure uses applicable portions of those of the Air Moving and Conditioning Association.

Incidentally, our sound test procedure requires that the same device be authenticated by having an air test made on it.

I should like to comment on the distinction between valid equipment ratings for sound output and measurements of sound pressure levels in the home. Out of understandable concern about sound levels where the equipment is in actual use, there have been experiments with dB(A) meter readings in the home to determine whether equipment is too noisy. One very great difficulty with this approach is that it cannot differentiate the sound from other equipment and even outside traffic and other sources. Nor does it reckon with the acoustical features of the room. This is not to say that there is no need for onsite criteria. But laboratory based ratings are available now, and should be used without waiting for appropriate ways to apply onsite criteria.

On behalf of the Home Ventilating Institute, I welcome your questions and comments about any phase of our sound ratings program. And the HVI welcomes the opportunity to work with other industries and with the Environmental Protection Agency for a quieter environment in the home.

Dr. MEYER. Thank you very much for giving us some, I would say, most intriguing and useful information. And I'd like to ask the panel, starting with my immediate left, Dr. Westman, on down and back up this way, if they have any questions.

Mr. BERLAND. Yes, just one. What's the distribution of this listing on sound levels? How is that distributed?

Mr. THOMPSON. This distribution is made many ways; first, through the association, which distributes it through building code committees, things of this nature. And it's also distributed by the member manufacturers to the people that sell their products. For instance, distributors or dealers in the field. It's also been publicized for mail-out to people through the use of our PR work in which we tell people about the HVI program on air ratings and sound ratings. And this has been in a great many newspapers and magazines since across the United States.

Mr. Berland. Have any of these manufacturers taken this rating and used it for labels?

Mr. Martin. You mean on the product?

Mr. Berland. Yes.

Mr. Thompson. All of them. We must label our products.

Mr. Martin. They must be labeled for both c.f.m. and sound.

Mr. Berland. Terrific.

Mr. Thompson. Not only on the products, but also in the catalog.

Dr. Meyer. Ted, I would presume also, since some of us are familiar with how things are done in the construction industry that this inevitably winds up in such things as sweeps and other reference documents.

Mr. Thompson. In sweeps, not yet. But it is being widely—well, for instance, in my own company, we have made mailings to our customers. I'm sure other companies have done the same thing.

Dr. Meyer. Any other comments on the left?

Dr. Ward. This essentially is a measure of the motor, though, isn't it really? I mean, if you take the joint function of the cubic feet per minute moved and the rated horsepower of the motor, don't you get a pretty good reference? Because, what I'm getting at is exactly how these things are installed still makes a big difference in how much noise there is to the denizens of the room, doesn't it?

Mr. Martin. Noise is affected, of course, by installation. But on the other hand, there is a great deal of inherent difference. If you look in here, you will find a fan moving 130 c.f.m. with a 8-sone noise level, and a 500-c.f.m. fan with a 6-sone noise level. So you can't say that the noise goes directly along with it. And incidentally, most of us do make rather pointed noise reduction recommendations in our fan installations. These are incorporated as standard installation instructions.

Mr. Martin. They are packed with every fan, and we suspect they are one of the first things that are thrown away.

Dr. Meyer. Along with instructions on what to do if it breaks down. And later on when the homeowner wants to find it, it isn't there.

Mr. Thompson. Ever since our first air rating standards, we have published two booklets, which we have mailed out to individuals. We have tried to educate the public on what is good ventilation, and also how it should be installed and the type of ventilation they should use. We published hundreds of thousands of these booklets. They have been passed out. We are modifying them at this time to include our sound testing program which became effective the first of this year.

Professor Cole. There seems to be an almost direct contridiction from what we heard from the two previous speakers, as far as ventilating appliances go anyway. You have said that quietness is important to your consumer. You have this lab rating program. I find it rather interesting.

Mr. **THOMPSON.** It is interesting. And I couldn't help but feel, as I was sitting here listening to need and want and so forth—we were talking just on the break about the fellow that checked into the motel, walked into the bathroom in the motel and turned on the light and the ventilator came on. And he's like most of us; the first thing he does is go up and take the grille off and pull out the motor so it doesn't make so much noise while we meditate.

Dr. **MEYER.** Well, I think these interesting contradictions are important to bring out, because it shows we do have to do a lot more work in all areas.

Dr. **GLORIG.** I just sort of wonder why you picked the sone since it's rather difficult to measure.

Mr. **MARTIN.** Well, there isn't, as far as I know, a sone meter that you can stick on something and measure sones. The sone is, of course, as you know better than most of us, a calculated number. See, the reason we did was we wanted something that we could present in every simple terms to two groups of, what we consider, unlearned people. One group is our own salesmen, and the other is the general public.

Dr. **GLORIG.** You mean you can explain the sone better to a novice than you can the decibel?

Mr. **MARTIN.** I have had much better luck, frankly, personally, over a period of several years.

Dr. **GLORIG.** You yourself said that 6 sones was twice as much noise as 3 sones, and the relation is not correct. It may be louder or less loud or something, but the factor of the noise——

Mr. **MARTIN.** I didn't mean to imply sound power levels, for instance, as referred to some source. We, of course, based this on a third octave sound power level.

Dr. **MEYER.** Any other questions, panel?

Professor **COLE.** I think the effort to make comprehensible the various sound measurements is useful. It gets the point across to the consumer; that seems to be the point.

Dr. **MEYER.** I think the thing of major importance here also is that it's giving us some ideas about how to approach the difficult problem of labeling. We're going to have a lot to do with this. It also indicates the importance of voluntary industry effort, and we will be back in touch with you on this.

Thank you very much, sir. We're looking forward to working with you.

And now I should like to ask the representatives of the Refrigeration Institute, Mr. Arthur Meling and Mr. Scott Bayless to come forward. I know that they have been working quite a bit in the field of noise associated with their industry's products, and I'm sure the panel and myself will find much of interest in what you have to say.

STATEMENT OF ARTHUR E. MELING AND W. SCOTT BAYLESS, REFRIGERATION INSTITUTE

Mr. **MELING**. Thank you Dr. Meyer, members of the panel and also ladies and gentlemen of the audience.

I am Arthur E. Meling, director of the Municipal and Government Relations for the Air Conditioning and Refrigeration Institute, which is the national trade association of manufacturers whose members produce more than 90 percent of all United States made air conditioning systems equipment, as well as related components and materials. This organization which traces its origins, through predecessor associations, to 1903, in continuous operation, represents 180 manufacturers, and is generally known as ARI, and we will refer to it that way in this presentation.

My associate is Mr. W. Scott Bayless, manager of all the engineering laboratories for the York Division of Borg-Warner Corp., and a member of the ARI task force that developed these standards.

And we are talking about a program period of something over 12 years. And in the interest of time, I'm not going to cover everything that's on the pages that you have there, but I would like to highlight——

Dr. **MEYER**. It will all be included in the record.

Mr. **MELING**. Thank you.

But I would like to highlight a little of the first three and a half pages, in the interest of background, before Scott and I discuss the two standards and the certification program. We hope to be informative in this manner.

As a result of research and development by its members and working with local political jurisdictions, ARI, through its Technical Committee on Sound, which was set up in the mid 1950's, and its staff, has gained considerable knowledge and experience in controlling and limiting environmental noise produced by air conditioning.

After years of research and study, a technical standard for measuring the sound-generation of air conditioning equipment was developed by the American Society of Heating, Refrigerating, & Air Conditioning Engineers, a technical society of well over 25,000 members. And this standard is known as ASHRAE Standard 36–62, which means it was published in 1962, although the work started on it back around 1956, and sharpened up in 1959. Now, based on this test standard, which describes how you have to test the stuff, the ARI standards and certification program has been developed. One of the standards is for rating and certification through independent laboratory tests of the sound-generating characteristics of outdoor unitary air-conditioning equipment and provides a uniform method for assigning a single rating number to this equipment. Not an octave band, but a single rating number. And it's interesting to note that in this project it has built into it a penalty for whines, screeches, and whistles, or the kind of noise that is disturbing and which you don't pick up with a meter. As was brought out on July 26, when we testified to the Senate Committee on Bill 1016, this method of rating—and this was developed by the Senator conducting the meeting—goes beyond just comparing machines to machines, and compares machines to people and the reactions of people to the types of noises, which it was established in the questioning to be a health factor.

ARI agrees that nuisance noise is essentially an urban problem, particularly in the residential areas. For this reason, the program described here, which applies to outdoor unitary equipment rated up to 135,000 B.t.u. per hour capacity, is applicable to the central residential and small commercial installations usually found in such urban residential areas, and our statement to you dwells on this type of installation.

Now, it's interesting to know that each time the distance from the equipment to the lot line or other point of evaluation where you choose to measure it is doubled, the decibel level at the point of evaluation is reduced by 6 decibels. If the distance is doubled from 15 to 30 feet, it's reduced by six. If it's doubled again, from 30 to 60, it's reduced by another six, for a total of 12. So, for example, if the equipment noise should be measured as 60 decibels at 15 feet, it would measure 54 at 30 feet, and only 48 at 60 feet, between where it's located and your reading point.

Now, under the auspices of this certification program, the first certifications were published in a directory that we have been publishing for over a dozen years, that certifies thermal capacity, the B.t.u. capacity for heating and cooling of unitary air conditioners and unitary heat pumps. And because this has a very wide distribution, well up in many, many thousands of copies, and because it's produced three times a year to keep it up to date, we added a third section covering these noise ratings to this directory to get the benefit of the distribution list and circulation we had established over all these years, and the acceptance that we enjoy for the capacity ratings of this equipment, which is referenced by Government agencies such as FHA, for example.

Now, the directory, as I said, is published three times a year, and the first issue including noise came out the first of this year. The one that the panel has, which is from April 1 to July 31, has in the back the conditions under which the ratings occurred and the ratings of over 500 models. Now, it's true that we are due for an August addition and it will come out this month. There's been a little delay because we had to switch our printing operation to put it on IBM-type equipment, and we expect it will be out before the end of the month. There are additional ratings and additional company members. We expect, as time goes on, that practically every piece of equipment that is rated thermally in here, either a cooling unit or a heat pump, will find its place in the ratings on sound.

Now, first Mr. Bayless will discuss the sound rating standard

270, which governs how it's done. And following that, I'll cover standard 275 and we will use slides for this purpose.

Mr. BAYLESS. Thank you, Art.

In response to the general trend of the 1960's toward a quieter community life, the air-conditioning industry, through ARI, embarked on a mission to develop a voluntary method of sound-rating their outdoor equipment. This rating would benefit the community through providing factual information on the sound energy radiated to the outdoors by air-conditioning equipment; would aid the contractor, planner or developer additionally through guidance in proper application, selection, and location of outdoor equipment to minimize acoustical intrusion upon that existence. Thus, in early 1965, plans were finalized and were started on developing a useful, easily understood method of sound rating equipment with a single number. Fortunately, much technology already existed in some form but remained to be adapted to the objectives of ARI's plan: That is, a simple outdoor equipment sound-rating standard and companion equipment application guide. The standard was issued in 1967, with a January the 1st, 1971, commencement date for an on-going sound certification program including published sound ratings on the outdoor equipment. This has been achieved.

I'll pause here a moment. Of course, you and I know from the local paper here which really depicts—some people, it may sound, don't do anything about it. ARI, as you can see back in the early 1960's, has done something about it.

The sound rating of outdoor unitary equipment must satisfy the following requirements:

First, as a basis, use equipment sound power level data on a frequency basis measured in conformance with an industry accepted method of measuring such levels This is the acoustical energy output of the equipment independent of any environmental effects or who, if anyone, hears it.

Second, adapt these levels on an energy and frequency basis to include the subjective response of people as listeners. The hearing response of people is not uniform with frequency over the range of normal hearing, that is, at frequencies lower than 1,000, or greater than 2,000 Hertz, more sound energy is required for them to sound equally loud. Further, people interpret single-frequency sounds, or tones, differently than sounds of a uniform wide-band of frequencies, the so-called broadband sound.

Third, for use by nonacoustical people, a single number indicative of the comparative level of the sound should rank-order the sounds the way they are heard. Each increment should be just significantly different from the one greater or lesser than it, as interpreted by the average listener.

Fourth, a sound certification program, a system of published sound ratings as determnied by each manufacturer for his equipment, updated periodically, which can be randomly checked by an independent organization for conformance and calibration.

Finally, fifth, compatible with an application standard which indicates to the contractor, installer, how to apply the sound rating to actual installations in an easy simple manner, and thus predict in advance the suitability of an overall installation.

To provide the equipment sound power levels, the ARI Sound Rating Standard uses those measured in accordance with the American Society of Heating Refrigeration Air Conditioning Engineers, ASHRAE, Standard 36-62, entitled the Measurement of Sound Power Radiated from Heating, Regrigeration and Air Conditioning Equipment issued February 1, 1962.

Could I have the second slide, please?

This test method standard rigorously specifies how to accurately measure sound energy in reverberant rooms, including sound spectrums containing single-frequency components. The method used is expected to become an ANSI Standard in the near future. In short, its technique is accepted and respected, being referenced in military and other Government specifications.

Now, the next slide.

Now, this standard requires a reverberant room, as I mentioned. This is a cutaway of a typically reverberant room. I'll show you some of the equipment that is necessary to make this standard—to make a measurement in accordance with this standard.

Could I have the next slide, please?

This is some of the instrumentation which is used for frequency analysis.

All right. The next slide, please.

This is a setup of a unit in the room with the microphone. You can see the hard walls of the room. This room, by the way, is isolated from the ground on low natural frequency springs.

People, unfortunately, do not hear equally loud sounds at all frequencies of the same energy level. As I said before, the human ear is less sensitive to low frequency and very high frequency sounds.

Let's have the next slide.

Human hearing is most sensitive between 500 and 5,000 Hertz, and less sensitive at higher and lower frequencies. To modify a sound rating number to include this human factor, the ANSI Standard S3.4 Computation of Loudness of Noise was used to determine a quasi Loudness Index.

Could I have the next slide?

Further, people are more sensitive to audible single-frequency components, pure tones, than broader-banded sounds of the same energy level at high frequencies above a thousand Hertz.

In this spectrum, which is on the screen here we have three equal spectrums as determined by the so-called contour method, yet are heard differently because the energy, which sound energy is a function of frequency, is distributed differently, yet they would still rate the same number.

When a broadband sound with audible tones is heard by a person it is interpreted by our complex hearing system as more objectionable than broadband sound, depending upon the frequency and level at which the tone exists. Considerable psychoacoustic work was done on this hearing phenomena, of which ARI has adapted the results as originally reported by Messieurs Blazier and Wells at the ASHRAE semiannual meeting February 11, 1963.

Now, the next slide.

Thus, the ARI Standard 270-67, Sound Rating of Outdoor Unitary Equipment, includes recent psychoacoustical knowledge of human response to discrete frequencies, and spectrum shape plus loudness. These human responses, when combined with accurate sound power levels, based upon the accepted test standard, produce a subjective sound rating number—or SRN, as we call it—which is indicative of equipment sound, and can be easily used to predict onsite sound levels as measured by a sound level meter, as will be shown later.

Next slide.

This is an example which is in the ANSI Standard in example B showing the frequencies, the equipment power level, which is the second column, and the adjustments which are made for pure tones, in this example, and the rating index, which is shown in the final column at the right. I don't know if you can see at the bottom—raise the slide—you can see we come up with a single number, which is actually 18. All this work is done by the manufacturer so that the final number—in this case, 18—would be all that the contractor would have to worry about.

All right. Next slide, please.

The air conditioning industry practices a system of voluntary self-control through a policy of equipment certification programs. Such programs assure the user, through certification on the unit via an ARI seal, that such units have been designed and tested in accordance with an industry standard. Since January 1, 1971, this is now applicable to outdoor unitary equipment up to a capacity of 135,000 B.t.u.'s per hour. This size includes nearly all residential air-cooled equipment. Certification requires that representative units from production be tested and rated in accordance with the procedure of the sound standard. The sound rating results are then published by ARI in a Directory of Sound-Rated Outdoor Unitary Equipment by manufacturer and model number.

Next slide, please.

Such tests are performed by the manufacturer in approved test facilities. However, randomly selected units are independently tested by an organization not affiliated with the industry as a verification of the ratings. Enforcement is strict. If a unit is independently tested, found to be inaccurately rated, the manufacturer must change the sound rating, improve and retest the unit to meet the original published rating, or withdraw it from the market. The ARI Sound Rating Seal of Certification may be displayed only on units meeting the sound standard requirements. All costs are borne by the industry or manufacturer.

To continue with this, I'll turn over to Art Meling to complete the presentation.

Mr. MELING. Okay. Now that you've heard how the sound rating number is determined, we want to talk about how it's used, and that's covered by the ARI Standard 275-69.

And you're looking here—I don't know whether you can read it from where you're sitting—but these are the over 500 rating numbers that I talked about a moment ago. They're in there by company name, and you get a number along the side showing in the example a rating number of 18. Now, the typical residential unit can run in a range of maybe 16 to 21 or 22. Most of them in the current directory in the size range from 2½ to 3 tons, let's say, are either 18, 19, or 20. And in the examples that I'm going to show you, you'll see how these are used. Now, the interesting part of this single number procedure is that it penalizes a unit that has the whines, whistles, and screeches. And if, as a manufacturer, you don't take them out, you'll end up with a higher number than you would have if you had removed them. So there's a built-in penalty.

Now, you're looking at pages and they're all there together. You can turn the pages and you can look at all the models, and you can look at all the model numbers and all the ratings on the model numbers. And this distribution is broad with the installing contractors. Now, you'll see as we go along that the installation is equally important to the number. You can take the best unit in the world and you can put it under your neighbor's bedroom window and you've got a problem. But you can take a unit with a higher number, install it farther away from the property line, do a good job on installing it, and you'll end up with an equal dB(A) level, let's say, at the property line that would meet some ordinance that would be acceptable. So the installation is equally important to the rating of the unit.

Now, that means that in order to get what you're after, the contractor is the key. And we have started out on an aggressive program to educate contractors. Now, the principal contractor association in the residential area is the National Environmental Systems Contracting Organization, commonly called NESCO. And they ran a training course at 15 colleges this year, and we put together the training material that was introduced to them. We couldn't get it together for the first one, but we taught the other 14. So I can say to you that somewhere around a thousand representative contracting organizations were trained in how to do this, how to use it, why it's important, what will it do for you through January, February and I believe, the first part of March. In addition, I made a presentation at their national convention right here in Dallas in February. And as a result of that, they are picking it up in their local chapters, and we supply slides and a tape, if they want it, or a script if they want it along with training material, and it seems quite effective based on the reports we're getting back.

Now, another large contracting group is the Refrigeration

Engineering Service Society, (RESS), and I will talk to their annual meeting in October in Atlanta. And we will do the same thing there, and they are incorporating it in their training material. Many of you here are aware of the three or four big documentary training directories or courses that they present to their members. And this is being incorporated in their advance course.

I will also have the privilege of making a presentation to the ASHRAE, that you've just heard, at their annual meeting in New Orleans in January. So we are making a sincere conserted effort to get at the next step, the fellow that controls the installation.

All right. Now, this is a practical way to predict sound levels, and through control of systems design, to obtain a predetermined level. And until we developed this—and I've been around many of these people for the last 7 or 8 years that are looking at regulations. Before we developed—before it was possible to develop, you couldn't tell. You had to put the darn job in and then go around with a meter and check it and see where you were. But with this approach, it's possible to sit down and determine what you have to do to meet—if there is a code—what's called for. If there isn't a code, we give you some kind of a guideline that you ought to come within.

Now, to make it a little bit easier to follow what I'm going to do, we've included in the packet to the panel a little orange book. And if you will look to the fourth page of that book, you will find, I believe, what's going to be the first slide here, please.

Next slide.

Yeah. Well, I should say first, the first step would be for the contractor to look up the number that you were just looking at on that page. You've got to start with that ARI number, and you get it either out of a directory or you get it off the manufacturer's spec sheet.

Now, here is the equipment. The contractor is shown how to assign an equipment location—location factors—based on the presence of sound reflective surfaces around the location of the unit. And if there are no surfaces, if it were standing in free space, no surfaces within 10 feet like you might have on a roof, for example, there is a factor value of zero. But in this drawing, you see two situations in which there is a single reflective surface. And as established in the standard, the factor value is one.

And the next slide.

And on the next page, diagram two, all these pages, when I call them off, are in the orange book, if they help you, or you get the same thing off the screen. Whatever you choose. On the next one, then, there are two situations where there are two reflective surfaces, and the factor value is two. And you'll see in a minute what you do with these factor values.

Next.

Next, the contractor is shown how to assign a barrier shielding factor, diagram three in the book, resulting from the presence of solid structures.

As Dr. Newman pointed out, the bushes and the trees are pretty, but they don't do anything for you, and neither do wooden slats. What you've got to do is put up a good hunk of masonry wall, and it's got to be high enough, as you will see, to give you the added distance, and it's got to be at least twice as wide so you don't get an end run around the side. And here you see two examples either from an extension of the building or a separate wall in itself between the unit and the point of evaluation. And in order to determine the barrier shielding factor, it's necessary to calculate a value, which is called "L". And that's the sum of two distances; the one that goes over the top of the wall, "L"-sub one, and "L"-sub two minus "D", which is the straight line distance between the unit and the point of evaluation. And when "L" has been calculated, the barrier shielding factor, again, is determined from a table by looking at the value in the charted diagram three, and then reading across from the "L" number to the direct factor value number. And you get that down here at the bottom. If "L" was one, then the factor value is two, and so on down, on up to a factor value of six.

Next slide.

Then instructions are given on the assignment of a sound path factor; that's in diagram four. When the point of evaluation is outdoors, then the factor is zero, such as if it were on the property line or a patio or something like that. Now, this factor is just for the path of sound from the point of evaluation, and the final preparatory step is the determination of the distance from the unit to the point of evaluation.

Next.

Now, the contractor is ready to work out the formula. He takes the sound rating number, whatever it may be, 18, 19, 20, let's say, and the equipment location factor, subtract the barrier shielding factor and the sound path factor. The result is the sound level number, abbreviated S-L-N.

Next slide.

He can now use what is called a Nomogram, which is printed in the standard and in the pad of calculation forms, which you gentlemen of the panel have in your envelopes. We sell these pads to the contractors. They have the Nomograms for calculating the job in pad form, and the top three sheets are the instructions of how you use it. This is designed for typical volume single-unit applications like you usually find in a residence. If you've got a real complicated job, you've got to go back to the standards because we didn't want to confuse the minor job with a lot of detail that you don't need on a simple job. And it's easy, you will see, to use.

Next.

Here we have a simple example of how it works. The point of evaluation, it's been assumed—or the point of evaluation is on the property line nearest the unit in this example, and assuming a unit SRN number of 19—and as you can see here, there's only one reflective surface around the unit, so the equipment location factor is one. There is no barrier shielding factor; that's zero. So the SLN number then is 20. And we are taking an example here with the distance from the unit to the point of evaluation as 40 feet.

Next slide.

And then you draw a line on the Nomogram from the sound level number on the left to the distance of 40 feet over there on the right, if you can see it. This is the 20 that we had as the SLN number we just figured. Now, we get a reading there of a dB(A) on the property line which turns out to be—if I can read it from here—53. It's a little hard to see it; you may not be able to see it.

Next slide.

Here's a more complex example. Example No. 2. And here, because you didn't have distance—distance is the biggest thing you've got working for you. If you've got the distance, take it. But if you haven't got the distance, then you have to make a low sound level. You're confronted with the need for constructing this masonry barrier wall we talked about, and here you see an example of it. And we've gone through the arithmetic of it. We've taken a high range number of 21; we've taken an equipment location factor—only one reflective surface—as plus one, and the barrier shielding factor in the table that we looked at, as you can see it here, is a minus two. And because it's an outside reading on the property line, we'll have a sound path factor of zero, and you end up with an SLN of 20.

And let's take the next slide.

And with the 20 as the SLN number, and the distance of 30 feet, you end up there again with something that looks like about 56 or seven dB(A) at the property line. So it's simple to use the Nomogram and determine what it will be.

Now, in conclusion, ARI agrees that nuisance noise is essentially an urban problem in residential areas. The ARI certification program is a form of labeling, and is cited as being now in effect, but the recommendation of it here does not preclude the use of ratings by a similarly recognized authority, should one be developed. It should be noted that ARI does not seek nor desire mandatory compliance with its program, but rather recognition as an acceptable form of labeling, and would like to continue to work with the EPA towards this end, since the ARI program already provides a nationally recognized standard.

I'd like to also mention that this orange booklet has been distributed to over 4000 political jurisdictions in this country in connection with our distribution of the new edition of the safety code for mechanical refrigeration. And in there we included a card inviting them, if they are considering regulations, to write back for a complete packet, in which we try to develop the basic philosophy behind what you've got to go after. And we're beginning to get quite a number of these replies coming in. These have just gone out within the last month or so.

We greatly appreciate this opportunity to present our views, and we'll be happy to try and answer any questions.

Thank you very much.

Dr. MEYER. Mr. Meling, Mr. Bayless, your test method is certainly a step forward. As we come to the question of labeling and standard setting, we've got to recognize the different techniques that are probably going to be needed for the different types of products. And so your industry's experience and innovation in taking this on is going to be very, very useful to the EPA. Before I ask a couple of questions, I'll ask if the panel has any. Panel on the left? Dixon, do you have anything?

Dr. WARD. No.

Dr. MEYER. It's such a lucid statement of how to get at it. Aram, do you have anything?

Dr. GLORIG. No.

Dr. MEYER. We're always getting confused with all the various attempts to use the complexities of the scientific side to come up with things. Maybe your approach provides a simplistic method.

Mr. BAYLESS. We've been 12 years developing this thing to this point. We're not all the way yet, but we think we've got it where it will work. The man in the field and the man on the street can appreciate it.

Dr. MEYER. Well, as you know, we're going to have a hearing in San Francisco dealing with standards and professional techniques, and I hope we'll have some further information from you on some of the specifics for that hearing.

Mr. MELING. You know this, Dr. Meyer, but some of the others may be interested. As a result of coming out now with something specific, we get a much better response than we did before. And we had one State recently that came out calling for 30 decibels at night on the property line with the equipment in operation. And yet when we were able to substantiate a factual presentation along this line and submitted it to the committee considering the ordinance, they passed it into law. And one of the biggest cities in the country has done the same thing, although there our efforts were more indirect. But they based it on our recommendations.

Dr. MEYER. Thank you very, very much.

I want to thank the members of the panel for serving with me. When Mr. Berland and Mr. Newman accepted, they both indicated that they had prior engagements, and that they would have to catch early flights. I appreciate very, very much the candidness and participation of you who we are trying to serve and the people who have attended this meeting. And I also want to express my appreciation to both the local EPA staff and my own staff.

Thank you very much. This has been a most important information gathering session for the Environmental Protection Agency.

This hearing is adjourned.*

*Additional materials submitted for the record are on file at the Office of Noise Abatement and Control.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1972 O—451-446